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Compilation of thesis abstracts, December 2008

Naval Postgraduate School
Monterey, California 93943-5138

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Compilation of

Thesis Abstracts

December 2008

Office of the Vice President and Dean of Research
Naval Postgraduate School

PREFACE

This publication contains abstracts of unrestricted or unclassified theses submitted for the degrees doctor of philosophy, master of business administration, master of science, and master of arts for the December 2008 graduation. Classified and restricted distribution abstracts are listed on the NPS SIPRnet.

This compilation of abstracts of theses is published in order that those interested in the fields represented may have an opportunity to become acquainted with the nature and substance of the student research that has been undertaken. Copies of theses are available for those wishing more detailed information. The procedure for obtaining copies is outlined on the last page of this volume.

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INTRODUCTION

Mission

The Naval Postgraduate School (NPS) was established to serve the advanced educational needs of the Navy. The broad responsibility of the school is reflected in its stated mission:

> Increase the combat effectiveness of U.S. and allied armed forces and enhance the security of the United States of America through advanced education and research programs focused on the technical, analytical, and managerial tools needed to confront defense-related challenges of the future.

To fulfill its mission, the Naval Postgraduate School strives to sustain excellence in the quality of its instructional programs, to be responsive to technological change and innovation in the Navy, and to prepare officers to introduce and utilize future technologies.

The research program at NPS exists to support the primary mission of graduate education. Research at NPS:

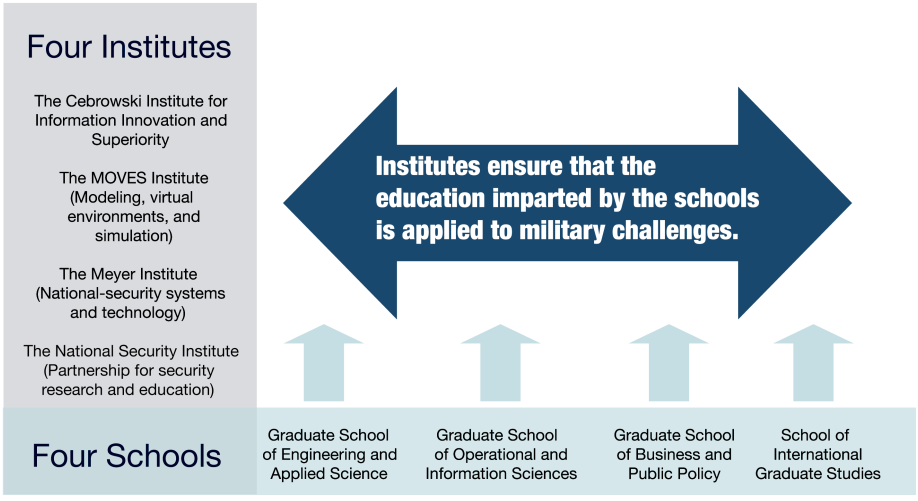
- maintains upper-division course content and programs at cutting edge;
- challenges students with creative problem solving experiences on DoD-relevant issues;
- advances DoN/DoD technology;
- solves warfare problems; and
- attracts and retains quality faculty.

Academic Programs

To meet its educational requirements, the Navy has developed a unique academic institution at the Naval Postgraduate School through the use of specially tailored academic programs, and a distinctive organization tying academic disciplines to naval and joint warfighting applications.

The Naval Postgraduate School has aligned its education and supporting research programs to achieve three major goals: 1) academic programs that are nationally recognized and support the current and future operations of the Navy and Marine Corps, our sister services, and our allies; 2) institutes that focus on the integration of teaching and research in direct support of the four pillars of Joint Visions 2010 and 2020 and their enabling technologies; and, 3) executive and continuing education programs that support continuous intellectual innovation and growth throughout an officer's career.

Integrated • Systems Oriented • Flexible • Partnered for Strength



INTRODUCTION

Programs of graduate studies at NPS are grouped as follows:

Graduate School of Operational and Information Sciences

- Computer Science
- Computer Technology
- Electronic Warfare Systems
- Human Systems Integration
- Information Sciences
- Information Systems and Operations
- Information Systems and Technology
- Information Warfare
- Joint C4I Systems
- Joint Information Operations
- Modeling, Virtual Environments, and Simulation
- Operations Analysis
- Operational Logistics, Joint
- Software Engineering
- Special Operations and Irregular Warfare
- Systems Analysis

Graduate School of Engineering and Applied Sciences

- Applied Mathematics
- Combat Systems Science and Technology
- Electronic Systems Engineering
- Meteorology
- Meteorology and Oceanography
- Naval/Mechanical Engineering
- Oceanography
- Operational Oceanography
- Reactors–Mechanical Engineering/Electrical Engineering
- Space Systems Engineering
- Space Systems Operations
- Systems Engineering
- Systems Engineering Management
- Undersea Warfare
- Underwater Acoustic Systems

Graduate School of Business and Public Policy

- Acquisition and Contract Management
- Contract Management
- Defense Business Management
- Defense Systems Analysis
- Defense Systems Management, International
- Executive Management
- Executive Master of Business Administration
- Financial Management
- Information Systems Management
- Material Logistics Support
- Manpower Systems Analysis
- Program Management
- Resource Planning and Management for International Defense
- Supply Chain Management
- Systems Acquisition Management
- Transportation Management

School of International Graduate Studies

- Civil–Military Relations
- Combating Terrorism: Policy, Strategy
- Defense Decision Making and Planning
- Homeland Defense and Security
- Homeland Security and Defense
- Security Studies
- Stabilization and Reconstruction
- National Security and Intelligence:
  - Middle East, South Asia, Sub-Saharan Africa
  - Far East, Southeast Asia, Pacific
  - Europe and Eurasia
  - Western Hemisphere

Students

The student body consists of U.S. officers from all branches of the uniformed services, civilian employees of the federal government, and military officers and government civilian employees of other countries. The resident degree/subspecialty student population for December 2008 is shown in Figure 1 on the following page.

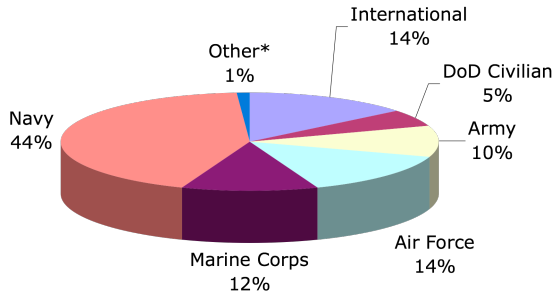


Figure 1: Resident Degrees/Subspecialty Student Population for December 2008 (1577 Concurrently Enrolled)

Academic Degrees

Curricula meet defense requirements within the traditional degree framework. All curricula lead to a master's; additional study may yield an engineer's or doctoral degree. Below is a listing of the degrees offered at NPS:

Master of Arts Degrees
National Security Affairs
Security Studies

Master of Business Administration

Master of Science Degrees
Applied Mathematics
Applied Physics
Applied Science
Astronautical Engineering
Combat Systems Technology
Computer Science
Computing Technology
Contract Management
Defense Analysis
Electrical Engineering
Electronic Warfare Systems Engineering
Engineering Acoustics
Engineering Science
Human Systems Integration
Information Operations
Information Systems and Operations
Information Technology Management
Information Warfare Systems Engineering
Management
Materials Science and Engineering
Mechanical Engineering
Meteorology
Meteorology and Physical Oceanography
Modeling, Virtual Environments, and Simulation
Operations Research
Physical Oceanography
Physics
Product Development
Program Management
Software Engineering
Space Systems Operations
Systems Analysis
Systems Engineering
Systems Engineering Analysis
Systems Engineering Management
Systems Technology

Engineer Degrees
Astronautical Engineer
Electrical Engineer
Mechanical Engineer

Doctor of Philosophy
Applied Mathematics
Applied Physics
Astronautical Engineering
Computer Science
Electrical Engineering
Engineering Acoustics
Information Sciences
Mechanical Engineering
Meteorology
Modeling, Virtual Environments, and Simulation
Operations Research
Physical Oceanography
Physics
Security Studies
Software Engineering

In December 2008, XXX degrees were conferred. Figure 2 indicates distribution by type, Figure 3 by degree area.

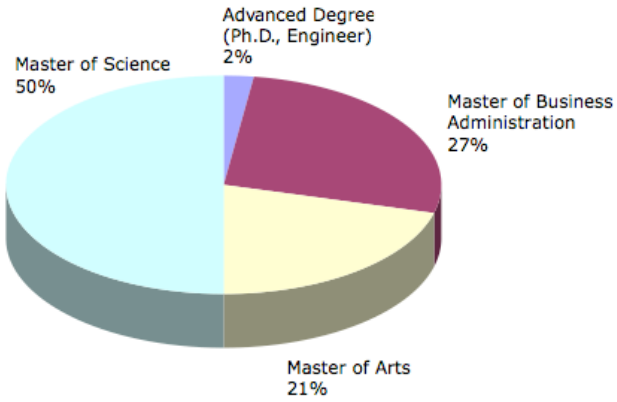
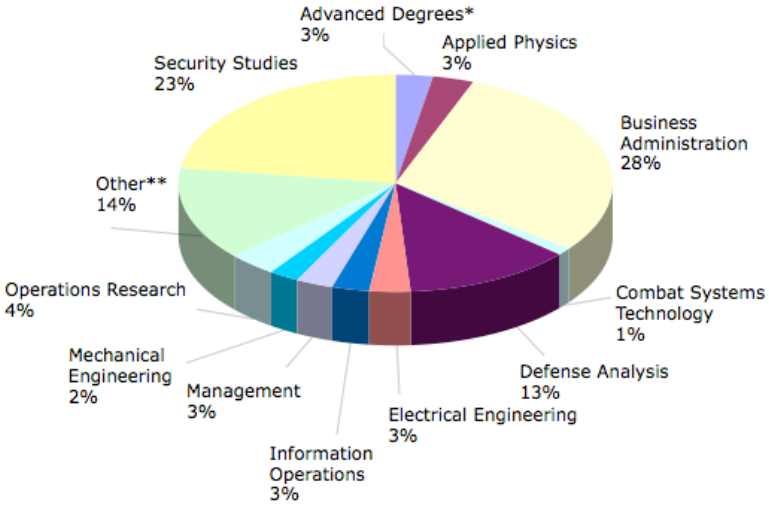


Figure 2. Distribution by Degree Type
(304 Degrees Conferred)



*Advanced degrees: one doctorate each in operations research, electrical engineering, mechanical engineering, computer science, software engineering (2), one electrical engineer
**Other master's degrees: applied mathematics (4), astronautical engineering (3), computer science (5), contract management (2), electronic warfare systems engineering (2), engineering acoustics (3), engineering science (1), human-systems integration (5), information systems and operations (1), information-warfare systems engineering (1), modeling, virtual environments, and simulation (5), physical oceanography (1), physics (4), program management (2), software engineering (1), systems engineering (5), systems engineering analysis (1), systems technology (1)

Figure 3. Degrees Conferred in December 2008
(304 Degrees Conferred)

Theses

The thesis is the capstone of the student's academic endeavor at NPS. Thesis topics address issues ranging from the current needs of the fleet and joint forces to the science and technology that is required to sustain long-term superiority of the Navy/DoD.

Aided by their faculty advisors, NPS students represent a vital resource within the DoD for addressing warfighting problems, one especially important at present, when technology in general, and information operations in particular, is changing rapidly. Our officers think innovatively and possess the knowledge and skill to apply nascent technologies in the commercial and military sectors. Their first-hand grasp of operations, when combined with a challenging thesis project that requires them to apply their focused graduate education, is one of the most effective elements in solving fleet/joint-force problems. NPS graduate education encourages a lifelong capacity for applying basic principles to the creative solution of complex problems.

NPS is unique in its ability to conduct classified research. Restricted theses are available on the NPS SIPRNET.

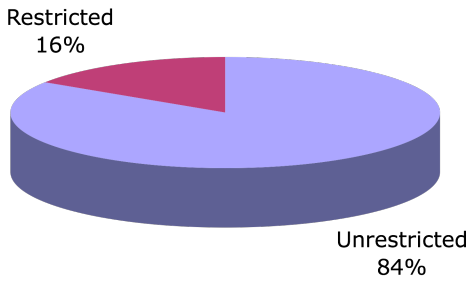


Figure 4. Classification of Theses (304 Degrees Conferred)

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ADVANCED DEGREES

DOCTOR OF PHILOSOPHY

ELECTRICAL ENGINEER

MASTER OF BUSINESS ADMINISTRATION

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MASTER OF SCIENCE

APPLIED MATHEMATICS

APPLIED PHYSICS

ASTRONAUTICAL ENGINEERING

COMBAT SYSTEMS TECHNOLOGY

COMPUTER SCIENCE

CONTRACT MANAGEMENT

DEFENSE ANALYSIS

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ADVANCED DEGREES

Doctor of Philosophy
Electrical Engineer

DOCTOR OF PHILOSOPHY

MEASUREMENT OF SOFTWARE-PROJECT-MANAGEMENT EFFECTIVENESS
Kadir Alpaslan Demir–Lieutenant, Turkish Navy
B.S., Turkish Naval Academy, 1999
M.S., Naval Postgraduate School, 2005
Doctor of Philosophy in Software Engineering–December 2008
Advisors: James Bret Michael, Department of Computer Science
John S. Osmundson, Department of Information Science
Committee Members: Man-Tak Shing, Department of Computer Science
Mikhail Auguston, Department of Computer Science
Gary O. Langford, Department of Systems Engineering

Evaluating, monitoring, and improving the effectiveness of project management can contribute to the successful acquisition of software systems. In this dissertation, a quantitative metric for gauging the effectiveness of managing a software-development project is introduced. The metric may be used to evaluate and monitor project-management effectiveness in software projects by project managers, technical managers, executive managers, project team leaders, and various experts in project organization. It also has the potential to be used to quantify the effectiveness-improvement efforts in project-management areas. The metric is validated by conducting survey studies on software projects from public and private sectors. A statistical analysis of sixteen surveys on software projects, spanning small to large development projects, indicates that there is a strong, positive correlation with software project success ratings provided by study participants and project-management effectiveness measurements. Other contributions of this research include identifying approaches for measuring the project management effectiveness of software projects, establishing theories on project management and project-management effectiveness measurement, and introducing and validating a framework for software project management.

KEYWORDS: Project Management, Software Project Management, Project Management Effectiveness, Software Project Management Effectiveness, Software Metrics, Software Project Management Effectiveness Metric, Theory of Project Management, Software Project Management Measurement, Software Project Management Framework, Theory of Software Project Management, Project Management Metrics

BREAKING BARRIERS TO DESIGN DIMENSIONS IN NEARLY ORTHOGONAL LATIN HYPERCUBES
Alejandro S. Hernandez–Colonel, United States Army
B.S., United States Military Academy, 1985
M.S., Naval Postgraduate School, 1994
Doctor of Philosophy in Operations Research–December 2008
Advisor: Thomas W. Lucas, Department of Operations Research

A dynamic and extremely complex landscape in security and world events presents problems that challenge all sectors of society to develop efficient means for exploring a wide range of solutions. Similarly, exponential increases in technological capability make it difficult for commercial and governmental leaders to assess those proposed solutions. Computer experimentation is an established method for examining complex models with large numbers of factors. Orthogonal and nearly orthogonal Latin hypercubes are proven techniques for designing simulation experiments. A key property of these efficient, space-filling designs is their ability to explore many factors within a relatively modest number of design points; however, there is a limited inventory of these designs currently available. Those that have been catalogued are usually computationally expensive to produce and have severe restrictions in the number of factors

and/or runs that they allow. To remedy this, a set of flexible methodologies to create design matrices with little or no correlation is presented—including saturated, nearly orthogonal Latin hypercubes. This new family of designs can explore as many factors as there are design points. This research also addresses experiments that include a mixture of continuous and integer variables, some of which have different numbers of value levels.

KEYWORDS: Computer Experiments, Design of Experiments, Mixed Integer Programming, Latin Hypercube, Optimization, Nearly Orthogonal

A PERFORMANCE ANALYSIS OF A JTIDS/LINK-16-TYPE WAVEFORM TRANSMITTED OVER SLOW, FLAT, NAKAGAMI FADING CHANNELS IN THE PRESENCE OF NARROWBAND INTERFERENCE

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M.S., Naval Postgraduate School, 2002
Doctor of Philosophy in Electrical Engineering–December 2008
Supervisor: R. Clark Robertson, Department of Electrical and Computer Engineering

Link-16 is a tactical data link currently employed by the United States Navy, the Joint Services, and forces of the North Atlantic Treaty Organization. It provides presumably secure and jam-resistant tactical information for land, sea, and air platforms. The communication terminal of Link-16 is called the Joint Tactical Information Distribution System (JTIDS); it features Reed-Solomon (RS) coding, symbol interleaving, cyclic code-shift keying (CCSK) for M-ary symbol modulation, minimum-shift keying for chip modulation, and combined frequency-hopping and direct-sequence spread spectrum for transmission security. In this dissertation, the performance of a JTIDS/Link-16-type waveform in both additive white Gaussian noise (AWGN) and narrowband interference when the signal is transmitted over a slow, flat Nakagami fading channel is investigated. In general, the results show that barrage noise interference has the most effect in degrading the JTIDS' performance when the signal-to-interference ratio (SIR) is small, whereas pulsed-noise interference for a smaller fraction of time that the interference is on causes the greatest degradation when the SIR is large, whether the channel is fading or not. In addition, two modified JTIDS/Link-16-compatible systems are proposed and evaluated. The first system uses errors-and-erasures decoding (EED) in place of errors-only RS decoding, and the second system employs a new 32-chip CCSK sequence instead of the 32-chip CCSK sequence chosen for JTIDS. For the first modified system, the results show that EED outperforms errors-only RS decoding in all cases, whether the channel is fading or not. With EED, the most significant improvement is found when both the fraction of time the interference is on is small and the signal-to-AWGN ratio is large. For the second modified system, the new 32-chip CCSK sequence, obtained from a search algorithm, allows for seven instead of six chip errors in the received sequence without making a symbol error, but the results show that the probability of symbol error obtained with the new CCSK sequence is only slightly better than that obtained with the sequence chosen for JTIDS.

KEYWORDS: AWGN, CCSK, EED, JTIDS, Link-16, MSK, Nakagami Fading Channels, Narrowband Interference, Probability of Symbol Error, Reed-Solomon Codes

COORDINATED CONTROL OF A PLANAR, DUAL-CRANE, NON-FULLY RESTRAINED SYSTEM

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B.S.A.&A.E., Purdue University, 1982
M.S.A.&A.E., Purdue University, 1990
M.S., Johns Hopkins University, 1996
Doctor of Philosophy in Mechanical Engineering–December 2008
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Second Reader: Fotis Papoulias, Department of Mechanical and Astronautical Engineering

In this dissertation, a control scheme that would provide motion compensation for a ship-based two-crane system suspending a single payload is developed.

Historical experience during the conflict in Vietnam, along with the introduction of standard containerized packaging, has steered military sustainment logistics towards a reliance on commercially developed cranes for the discharge of containers – even for instream lightering operations. With the inclusion of seabasing as one of the Navy's pillars, there has been a resurgence in interest in cargo transfer technology. While several approaches to the movement of individual containers have been pursued, there has not been a similar focus on the handling of outsize cargo in the military logistics-over-the-shore (LOTS) operating environment.

This work includes an algorithm for the coordinated control of two cranes to facilitate the movement of cargo. The use of multiple cranes may be required by either the geometric extent or the weight of the cargo. The kinematic chain is developed for the incompletely restrained, cable-suspended system that describes this system. With the inclusion of the dynamics of the system to fully describe the force and moment constraints, the equations of motion can be inverted to yield expressions that relate desired payload motion to crane control inputs.

The presence of seaway-induced motions on the ship platform introduces disturbances that must be accounted for in the kinematics of the ship-attached crane reference frame and must be compensated for by the dual-crane system. Without this motion compensation, the operational capability is limited by the environment. With this system, the payload is isolated from the ship motion and held fixed in inertial space. The weighted-norm method used to derive the solution allows for distribution of the actuation effort of the system, which could be useful in actual operations of the cranes onboard a vessel and provides an opportunity for optimization by judicious selection of the weighting matrix. Future development of coordinated control for dual-crane systems may also employ trajectory planning to automate the movement of large payloads.

Results from a MATLAB/Simulink simulation and selected results from a 1/32nd-scale model are presented to illustrate the concepts developed.

KEYWORDS: Shipboard Cranes, Motion Compensation, Inverse Kinematic Control, Minimum Norm Solution, Logistical Operations

APPLICATION OF REAL OPTIONS THEORY TO SOFTWARE ENGINEERING FOR STRATEGIC DECISION-MAKING IN SOFTWARE-RELATED CAPITAL INVESTMENTS

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M.S., Johns Hopkins University, 2000
M.B.A., Johns Hopkins University, 2002
Doctor of Philosophy in Software Engineering–December 2008
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Jonathan Mun, Department of Information Sciences

As it stands today, software is the major expense in software-intensive weapons systems. Therefore, software is and should be treated as a capital investment, and an approach emphasizing a strategic investment methodology in its acquisition is necessary. The strategic flexibility in software engineering decisions can be valued as a portfolio of options or real assets, much akin to options on financial securities which have real economic value under uncertainty. This approach would emphasize the linking of program

management decisions to current and future unknown situations within the stipulated parameters of cost, schedule, and functionality, thus giving the managers a set of choices or options. This dissertation describes a strategic decision-making process based on the general concepts of initiating the software acquisition process with a situation assessments phase, identifying un-resolvable high-level uncertainties, generating the appropriate strategic actions, and deriving the benefits or value created either explicitly or in the form of real options. A framework based on Real Options Theory is presented to allow decision makers to better balance customer requirements as dictated by operational needs within financial viability and schedule constraints through the identification, valuation, and optimization of strategic-decision pathways created in the form of real options. The framework is applied to the software component (Future Combat Systems Network) of the U.S. Army Future Combat System. This study finds that when properly formulated, a real options approach could be used as an effective risk-management tool to guide decision making at the software acquisition level, further complementing the risk-driven spiral-development approach currently being utilized in the U.S. Department of Defense evolutionary acquisition model.

KEYWORDS: Real Options, Strategic Investments, Software Acquisitions, Risk Management, Software Engineering

AN APPLICATION OF ALLOY TO STATIC ANALYSIS FOR SECURE INFORMATION FLOW AND VERIFICATION OF SOFTWARE SYSTEMS

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B.S., United States Naval Academy, 1986
M.S., Naval Postgraduate School, 1995
Doctor of Philosophy in Computer Science–December 2008
Supervisor: Mikhail Auguston, Department of Computer Science

Within a multilevel secure (MLS) system, flaws in design and implementation can result in overt and covert channels, both of which may be exploited by malicious software to cause unauthorized information flows. To address this problem, the use of control dependency tracing has been explored to present a precise, formal definition for information flow. This work describes a security Domain Model (DM), designed in the Alloy formal specification language, for conducting static analysis of programs to identify illicit information flows, such as control dependency flaws and covert channel vulnerabilities. The model includes a formal definition for trusted subjects, which are granted extraordinary privileges to perform system operations that require relaxation of the mandatory access control (MAC) policy mechanisms imposed on normal subjects, but are trusted to behave benignly and not to degrade system security. The DM defines the concepts of program state, information flow, and security policy rules, and specifies the behavior of a target program. The DM is compiled from a representation of the target program, written in a specialized Implementation Modeling Language (IML), and a specification of the security policy, written in the Alloy language. The Alloy Analyzer tool is used to perform static analysis of the DM to detect potential security-policy violations in the target program. This approach demonstrates that it is possible to establish a framework for formally representing a program implementation and for formalizing the security rules defined by a security policy, enabling the verification of that program representation for adherence to the security policy.

KEYWORDS: Security Domain Model, Static Analysis, Automated Program Verification, Trusted Subjects, Covert Channels, Dynamic Slicing, Specification Language

ELECTRICAL ENGINEER

TESTING AND EVALUATION OF A PEN-INPUT DEVICE USING AN INERTIAL/MAGNETIC SENSOR MODULE

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Electrical Engineer–December 2008
Master of Science in Electrical Engineering–December 2008
Advisor: Yun Xiaoping, Department of Electrical and Computer Engineering
Readers: Roberto Cristi, Department of Electrical and Computer Engineering
Marcello Romano, Department of Mechanical and Astronautical Engineering

In this thesis, the feasibility of developing a pen input device using an inertial/magnetic sensor module is investigated. The emphasis is on testing and evaluation of algorithms for computing handwriting trajectories based on accelerometer measurement data. This research starts by placing the inertial/magnetic sensor in a 2D plane and writing alphanumeric characters. Before continuing to evaluate the 3D writing, a calibration algorithm is implemented for computing the length between the nose of the pen input device and the point where the inertial/magnetic sensor is attached to the pen. A velocity correction algorithm is also applied by recognizing the pause phases in the writing in order to eliminate the drift in acceleration measurements and accurately reproduce handwriting trajectories. Extensive experiments conducted for 2D and 3D writings indicate that it is possible to develop a pen input device to track handwriting using an inertial/magnetic sensor module. However, the performance of the handwriting tracking depends on the accuracy of the sensor module and the speed of the writing motion.

KEYWORDS: Pen Input Device, Accelerometer, Handwriting, Quaternion

MASTER
OF
BUSINESS ADMINISTRATION

MASTER OF BUSINESS ADMINISTRATION

A STUDY OF THE MINE-RESISTANT AMBUSH-PROTECTED (MRAP) VEHICLE AS A MODEL FOR RAPID DEFENSE ACQUISITIONS

Seth T. Blakeman–Major, United States Army
Master of Business Administration–December 2008
Anthony R. Gibbs–Major, United States Army
Master of Business Administration–December 2008
Jeyanthan Jeyasingam–Major, United States Army
Master of Business Administration–December 2008
Advisors: Lawrence R. Jones, Graduate School of Business and Public Policy
Michael W. Boudreau, Graduate School of Business and Public Policy
CDR Brett A. Wagner, USN, Graduate School of Business and Public Policy

The purpose of this MBA project is to analyze the procedures followed in the acquisition of the mine-resistant ambush-protected (MRAP) vehicle. The MRAP program, initiated in response to the improvised explosive device (IED) threat in Iraq and Afghanistan, is unprecedented in timeline and scale. As such, it provides a unique case study on the rapid acquisition of a major military system in response to an urgent operational need.

The objective of this research is to provide a guide for future rapid acquisition programs by documenting the conduct of the MRAP program from the initial needs identification and program start in 2006 through production and fielding at the time of this writing. The major analysis focuses on the program as a rapid acquisition within the context of the Acquisition Management and Joint Capabilities Integration and Development System (JCIDS) framework. The goal of this analysis is to answer the following question: what are the key factors and decisions that contributed to program success, with success defined as meeting program objectives and warfighter needs? In addition, this report addresses the key trade-offs made within the MRAP program and the potential long-term impacts of these decisions.

KEYWORDS: Rapid Acquisitions, MRAP, Mine Resistant Ambush Protected, Expedited

THE DEVELOPMENT OF AN ITEM UNIQUE IDENTIFICATION STRATEGY FOR THE LEGACY COMPONENTS OF THE U.S. MARINE CORPS M1A1 ABRAMS TANK

Edward Y. Blakiston–Major, United States Marine Corps
Master of Business Administration–December 2008
Carl J. Punzel–Captain, United States Marine Corps
Master of Business Administration–December 2008
Richard A. Jennings–Captain, United States Marine Corps
Master of Business Administration–December 2008
Advisor: Geraldo Ferrer, Graduate School of Business and Public Policy
Second Reader: Daniel A. Nussbaum, Department of Operations Research

The Office of the Secretary of Defense (OSD) has mandated that every component that meets certain cost and management criteria in the Department of Defense (DoD's) tangible inventory must have a valid item unique identification (IUID) mark by December 2010. The IUID program is expected to increase force readiness, enhance the lifecycle management of assets, and provide more accurate asset valuation to achieve unqualified audit opinions on DoD financial statements. One of the challenges of the program is to achieve IUID-marking saturation throughout in-use, or legacy, inventories with minimal interruption of

operational readiness. The purpose of this project is to propose an effective implementation strategy for the legacy items that meet the DoD's requirements for IUID marking in the U.S. Marine Corps M1A1 Abrams tank community. This plan could potentially serve as a model for other communities facing the challenge of IUID implementation. This project examines different implementation alternatives and identifies and develops the determined best course of action. In addition, an estimation of the costs to implement the chosen plan is provided for comparison and decision-making purposes.

KEYWORDS: Item Unique Identification, IUID, Legacy Components, M1A1 Abrams MBT, CFO Act 1990

INTRODUCING PROFESSIONAL WRITING SKILLS TO FUTURE NAVAL OFFICERS: AN ADJUNCT TO NAVAL POSTGRADUATE SCHOOL DISTANCE LEARNING

Brandon M. Booher–Lieutenant, United States Navy
Master of Business Administration–December 2008
Derek S. Waisanen–Lieutenant, United States Navy
Master of Business Administration–December 2008
Advisors: James Suchan, Graduate School of Business and Public Policy
Cary Simon, Graduate School of Business and Public Policy

Newly-minted naval officers will be judged by seniors on the merits of their writing skills. Required undergraduate English composition courses do not prepare officers to write clear, well-organized correspondence required during active duty service.

This project answers the following question: will written communication training provided to midshipmen prior to commissioning enable them to report to their first assignments with the written communication knowledge and skills to communicate their intentions clearly at first attempt and write with impact, thus decreasing the administrative burden on senior officers. To answer this question, professional writing training in the form of interactive modules was provided to 17 NROTC midshipmen at Marquette University and their understanding and capacity to apply the concepts was assessed.

Midshipmen earned scores that met or exceeded the criteria for comprehension of the guidelines for professional writing. In addition, midshipmen interview responses were overwhelmingly receptive to this training, and, as a result, 100-percent of midshipmen surveyed felt better prepared for future professional writing tasks.

It is recommended that the Naval Education and Training Command (NETC) mandate standardized writing training for midshipmen prior to their commissioning. Additionally, it is recommended that the Naval Postgraduate School partner with the NETC to assist in creating a distance-learning tutorial for professional writing.

KEYWORDS: Managerial Communications, Communications Effectiveness, Communications Efficiency, Business Writing, Professional Writing, Technical Writing, Military Writing, Naval Writing, Clear Writing, Academic Writing, Bottom-Line, High-Impact, Discourse, Discourse Community, Writing Tutorials

A UTILIZATION ANALYSIS OF THE NAVY'S FINANCIAL-MANAGEMENT SUBSPECIALTY CODED OFFICERS

Michael P. Borrelli–Lieutenant Commander, United States Navy
Master of Business Administration–December 2008
Advisors: CAPT Lisa Potvin, USN, Graduate School of Business and Public Policy
William R. Gates, Graduate School of Business and Public Policy

The Army, Air Force, and Navy all have a cadre of Financial Management (FM) officers. Although the three military services all employ FM military officers, the structure, management practices, and policies governing each service's FM officer communities differ. One consequence is that each service experiences a different FM officer utilization rate. This thesis presents each service's approach to its FM community structure and management, identifying strengths, weaknesses, and utilization rates. Using Nadler and

Tushman's Congruence Model, an analysis of the Navy's FM community is conducted. This analysis identifies areas in which the Navy can improve the utilization rate of its FM subspecialty coded officers.

KEYWORDS: Financial Management, Utilization, Navy Officer Career Paths, FM Community Manager

AN ANALYSIS OF EMPLOYMENT OF A DISASTER-RELIEF DAMAGE-ASSESSMENT SYSTEM USING DISCRETE EVENT SIMULATION

Richard J. Bridgett–Captain, United States Marine Corps
Master of Business Administration–December 2008
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This project uses discrete event simulation to model and analyze the process of setting up and employing a damage assessment system for information-gathering after a disaster. The process that is modeled was originally performed as a live simulation in May 2008. The live simulation experiment was conducted by a research team affiliated with the Naval Postgraduate School (NPS), including the author, and was based on a post-tsunami scenario that combined numerous surveillance and communications technologies. With information obtained from this experiment, a discrete event simulation model is created to accurately represent the live simulation. The model is then enhanced to include realistic variability for all processes. In addition, further enhanced models are created to simulate likely equipment failures and weather delays in order to estimate how long the process would take given these various conditions. The addition of delays to the model results in more realistic cycle times giving the project increased validity. The project provides the disaster relief/humanitarian research community with a realistic analysis tool for assessing the process of setting up and employing a damage assessment system following a disaster. The results give an expected completion time and range under the conditions modeled.

KEYWORDS: Discrete Event Simulation, Damage Assessment System, Disaster Relief/Humanitarian Assistance

OFFSET IMPLEMENTATIONS FOR TURKEY'S INTERNATIONAL DEFENSE ACQUISITIONS

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"Offsets" is the umbrella term for a broad range of industrial and commercial compensatory practices. Specifically, offset agreements in the defense environment are increasing globally as a percentage of exports. Developed countries with established defense industries use offsets to channel work or technology to their domestic defense companies. Countries with newly industrialized economies are utilizing both military- and commercial-related offsets that involve the transfer of technology and know-how. Overall, offsets are definitely not new, and they occur under a variety of names. In the defense industry, offsets are now an accepted practice among both sellers and purchasers, and they are likely to remain so for the indefinite future. This research discusses defense offsets within the context of international trade and the global arms trade. This discussion draws upon the existing body of theory and practice on offsets (as identified in the literature review) to provide a basic understanding of offsets within the wider international-trade context. The offset policies of selected countries are analyzed prior to exploring the development of the Turkish offset policy. Additionally, sample defense-acquisition programs are examined as case studies to explain the incentives within Turkish offsets and to suggest future offset policies.

KEYWORDS: Offset, International Trade, Turkish Offset Policy

THE LAND-WARRIOR SOLDIER SYSTEM: A CASE STUDY FOR THE ACQUISITION OF SOLDIER SYSTEMS

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This project provides an analysis of the Army's acquisition of the Land Warrior (LW) Soldier System. The objectives of this research are to document the history of the LW and provide an overview of the program in order to establish the components of both its development and deployment and its associated business and management characteristics. The end-product is a document that provides an analysis of the actions taken and the obstacles encountered and how the materiel developers, warfighters, user representatives, and lawmakers dealt with them.

The LW need was approved in 1993. The requirement was to provide improvements for dismounted soldiers in the five specific capability categories of lethality, command and control, mobility, survivability, and sustainment. The LW has evolved over a period lasting approximately fifteen years. Despite this evolution, the Army terminated the program in FY2007. Regardless, the LW has laid the foundation for follow-on soldier-system initiatives. The LW was unsuccessful initially due to the misalignment of three interrelated and supporting components: 1) technical immaturity, 2) poor user acceptance, and 3) lack of senior leadership support. Successes that are more recent can be attributed to: 1) soldier-driven design, 2), improved technical maturity, and 3) proven employment of the system in combat with warfighters.

KEYWORDS: Land Warrior, Land Warrior Soldier System, Soldier as a System, Ground Soldier Ensemble, 4-9 Infantry Battalion, Unit System Integrators, TCM Soldier, PEO Solider, Program Manager Soldier Warrior, Product Manager Land Warrior, General Dynamics C4 Systems, Net-Centric Warfare

AN ANALYSIS OF THE CAMP PENDLETON, CALIFORNIA, BUDGET AND EXECUTION PROCESS

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This research project evaluates the budgeting and execution process of the Camp Pendleton medical treatment facility (MTF); and how the proposed prospective payment system (PPS) impacts the traditional way of funding MTFs. The research analyzes the budgetary policies and practices of MTFs, how MTFs fit in the overall budgeting process of the Navy via the Bureau of Medicine and Surgery (BUMED), how the MTFs formulate and execute budgets, how to validate increases in departmental budget requests, what are the budgetary responsibilities of the comptroller and major stakeholders (i.e., MTF department heads, branch medical clinic officer in charge, OPTAR holders), and what internal controls are in place to monitor the obligation and execution of funds. BUMED is currently changing the methods it employs in funding MTFs to efficiently control the ever-increasing cost of health care and be able to support its mission and align the defense health program (DHP) with the Department of Defense budget, which is facing budgetary constraints. The Assistant Secretary Of Defense For Health Affairs plans to implement the PPS, which is similar to a performance-based budgeting process that focuses on value rather than cost of health care. This research also evaluates how the MTF prepares for the transition to the new budgeting process.

KEYWORDS: Budget Formulation, Budget Execution, Prospective Payment System

A DECISION MODEL FOR FORECASTING PROJECTED NAVAL ENLISTED-RESERVE ATTAINMENTS

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The intent of this MBA project is to forecast naval enlisted reserve attainments for a given fiscal year, so that Commander, Navy Recruiting Command (CNRC) can adequately establish goals. Forecasting is based on historical data from various sources. Three levels of data are examined. These levels include CNRC data broken down by total yearly accessions, CNRC data sorted by accessions and ratings, and Defense Manpower Data Center (DMDC) data sorted by accession source (naval veteran, other service veteran, non-prior service) and ratings.

All three sets of data are compared to each other, as well as to previous research, to ensure that the data is accurate and to try to determine if there are trends. Moving average, weighted moving average, and exponential smoothing are used on all data to determine which method is best in forecasting future attainments. In addition, a regression model is developed for the CNRC yearly accession data; this model is compared to the other models to determine if it is a better forecasting tool.

DMDC data is used to determine the origins of specific reserve attainments and to forecast future attainments. The model is used to forecast the possibility of a naval veteran or non-prior service individual joining the Naval Reserve. The data is used to help the Navy recruiting command establish more accurate reserve recruiting goals.

KEYWORDS: USNR, Enlisted Modeling, Navy Reserve, Statistical Forecasting

THE JOINT EFFECTS-BASED CONTRACTING EXECUTION SYSTEM: A PROPOSED ENABLING CONCEPT FOR FUTURE JOINT EXPEDITIONARY CONTRACTING EXECUTION

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In this MBA project, an intellectual framework is presented for the Joint Effects-Based Contracting Execution System (JEBCES), and within JEBCES, a researcher-proposed Phased-Based Acquisition Capability (PBAC) as an enabling concept. Through discreet-event modeling and simulation of PBAC using FY07 Joint Contingency Contracting System data, it is found, to the extent that the Department of Defense standardizes kinetic and post-kinetic operational requirements for future joint-expeditionary operations, that the enterprise can reduce variations in both warfighter requirements definitions and Contingency Contracting Officer execution methodologies. As a result, contractors assisting the force can optimize their supply chains to enable time-definite delivery of supplies and services through all phases of the Combatant Commander's Campaign Plan. PBAC provides the future joint-expeditionary contracting force with a capability at the beginning of warfighter operational-planning cycles.

KEYWORDS: Joint Expeditionary Contracting Execution, Effects-Based Contracting, Operational Contract Support

ASSESSING OPTIONS FOR CONTINGENT CONTRACTING OF MERCHANT SHIPS FOR NAVAL AND EXPEDITIONARY OPERATIONS

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Strategic sealift is a perpetual concern for every naval officer planning naval operations. Historical experiences (such as WWII, the Korean War, the Vietnam War, Operation Corporate, Operations Desert Shield/Desert Storm, and the 2006 Lebanon evacuation of foreign nationals) help us understand the great importance of merchant shipping in naval operations.

The types of merchant ships most useful for military operations, as well as the sealift organization and capabilities of Greece, the U.S., NATO, the European Union, and the Athens Multinational Sealift Coordination Center, are reviewed in this thesis.

It also analyzes the shipping industry, which is highly specialized. Accordingly, naval officers and government executives need to thoroughly understand its peculiarities, as well as its capabilities and limitations in military operations. This thesis discusses the structure of shipping markets; and analyzes the methods available for contingency contracting of merchant vessels (spot market, lease, options, and requisition) for naval and expeditionary warfare, particularly leasing and options. The advantages and disadvantages of the various methods of acquiring merchant shipping are presented in detail.

A number of conclusions are reached and recommendations are provided regarding merchant shipping in naval operations; these recommendations can be useful for all naval officers, especially those planning sealift support for naval operations.

KEYWORDS: Merchant Shipping, Ship Leasing, Ship Requisition, On-Spot Chartering

THE CHOICE: SOCIAL REPRESENTATION AND THE FORMATION OF THE HELLENIC ARMED FORCES

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As societies in the developed part of the world have evolved, so have new trends in military staffing. The basic trend that used to exist globally (until the end of WWII) was the conscription system, through which all citizens were obliged to serve. During the 20th century, when globalization became the new world concept, terrorist attacks devaluated armies, and people became wealthier and more independent, military staffing, as an issue closely related to society, was also affected. The new trend is the all volunteer force.

The present military conscription system of Greece consists of two types of soldiers: draft soldiers and volunteers. The recent trend in Greece is towards the all-volunteer force. Nevertheless, that trend has raised many arguments about the effect of a lack of social representation, which is directly connected to military efficiency.

This research investigates one aspect of that dilemma: the social representation factor in the structure of the Hellenic military. As a compass, the authors use the U.S. and other countries' examples, along with the military-representation model created by Mark J. Eitelberg. The goal is to assess the military effectiveness of the Hellenic armed forces.

KEYWORDS: All Volunteer Force, AVF, Draft, Conscript, Soldiers, Hellas, Greece, Armed Forces, Social Representation, Socioeconomic, Military Sociology, Novel

THE SELECTION METHODOLOGY OF H-1 COMPONENTS AS POTENTIAL CANDIDATES FOR PERFORMANCE-BASED LOGISTICS CONTRACTS

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The purpose of this project is to devise a method to evaluate H-1 components as possible candidates for performance-based logistics (PBL) contracts. The objectives of this project are: 1) to provide an overview of the H-1 program; 2) to provide an overview of PBL contracts for component support; and 3) to explore methods of identifying components as PBL candidates specifically for the H-1 community, through an analysis of readiness data, interviews with subject matter experts, and the use of Crystal Ball as a forecasting mechanism.

KEYWORDS: Performance Based Logistics, H-1

GRADUATE SCHOOL OF BUSINESS AND PUBLIC POLICY FACULTY PERCEPTIONS OF SYNCHRONOUS DISTANCE-LEARNING TECHNOLOGIES

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Distance learning (DL) is a formal learning activity that occurs when students and instructors are separated by either time or geographical distance. Since the learning and teaching occur in different places, DL requires special course design and instructional techniques, as well as special communication techniques and organizational-administrative arrangements. DL programs have various delivery methods, using either asynchronous (email, web, videotape) or synchronous (video teleconferencing, Elluminate) communications technologies. There are several potential benefits of DL, such as reaching students who do not have easy access to education, providing flexibility in class times, mass delivery of education, improving the quality of learning as compared to traditional classroom-based instruction, and preparing students for a knowledge-based society. However, limitations and concerns are also evident in this new learning environment. Many challenges associated with DL focus on faculty issues and concerns. The aim of this project is to review the perceived difficulties of DL teaching from the perspective of faculty who teach DL programs in the Graduate School of Business and Public Policy at the Naval Postgraduate School, and then to recommend sound solutions in order to ensure program success.

KEYWORDS: Synchronous Distance Learning, Video-Teleconferencing, Elluminate, Distance Learning Environment

DDG 1000 VS. DDG51: AN ANALYSIS OF U.S. NAVY DESTROYER PROCUREMENT

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The research presented is a comparative analysis of DDG 51 and DDG 1000 destroyer programs in terms of acquisition strategy, cost structure, and capability. The DDG 51 is arguably the most successful surface ship program in modern U.S. naval history, with sixty-two ships purchased between FY1985 and FY2005. DDG 51's success can be attributed to excellence in multiple warfare areas, predictable cost structure, and the use of proven technologies that were incrementally upgraded. The DDG 1000 has been in development since the mid 1990s and has been the subject of harsh criticism due to cost overruns and the slow maturation of critical technologies.

Recently, despite years of support from Navy shipbuilding officials, the Chief of Naval Operations requested that the DDG 1000 program be truncated to two ships in order to clear the way for the purchase of eight additional DDG 51s between FY2010 and FY2015. The Navy based its reasoning primarily on emerging threats that the DDG 1000 was not able to deter.

This research supports the Navy's recommendation to truncate the DDG 1000 program at two ships and reopen DDG 51 production lines. The DDG 51's versatility and established cost structure bring the Navy closer to its goal of 313 ships while ensuring the ability to counter emerging threats. The DDG 1000, despite its impressive new technologies, simply did not add enough capability to warrant its excessive cost growth. The DDG 1000 program, however, was not a waste of time or money. The DDG 1000 will provide the Navy with increased capability in the littorals and will serve as a technological test platform that will bridge the gap to future classes of surface ships.

KEYWORDS: Arleigh Burke, DDG 51, DDG 1000, Destroyer

AN ANALYSIS OF ORGANIZATIONAL READINESS AT ANNISTON ARMY DEPOT FOR INFORMATION TECHNOLOGY CHANGE

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The purpose of this MBA project is to assess the change readiness of Anniston Army Depot's (ANAD) organizational climate—especially now, as the depot prepares for large-scale, logistics modernization program (LMP) information technologies (IT) change. ANAD is a highly important division of the United States Army Materiel Command (AMC). It is the Army's designated center of industrial and technical excellence for a variety of combat vehicles, artillery equipment, bridging systems, and small-caliber weapons. It provides advanced maintenance support for all of these systems, in addition to fulfilling a host of other vitally important, Army-wide logistical functions. ANAD presently uses the standard depot system (SDS) to manage its complex array of administrative and logistical functions. However, AMC has mandated that ANAD completely replace the SDS and employ the new LMP starting in December 2009. The researchers gather a combination of historical information, personnel observations, and responses to survey questionnaires on readiness for change in order to conduct a quality analysis of ANAD structure and climate and their implications, if any, for LMP implementation. Ultimately, people are the heart of any IT system, regardless of its size and degree of automation. The tremendous importance of organizational personnel in the change process is often under-appreciated and under-addressed in the civilian sector of the military—particularly when this sector embarks on significant IT transformation initiatives. Bold IT actions

inevitably have a profound impact on any organization, regardless of its size, mission, and personnel composition.

This project is conducted with the sponsorship and assistance of the Anniston Army Depot.

KEYWORDS: Logistics Modernization Program, Anniston Army Depot's, Center of Industrial and Technical Excellence, Standard Depot System, Readiness for Change, Attitudinal Outcome Hypotheses, Organizational Change, Information Technology Implementation

THE FEASIBILITY OF RADIO-FREQUENCY IDENTIFICATION (RFID) AND ITEM UNIQUE IDENTIFICATION (IUID) IN THE MARINE CORPS SMALL-ARMS WEAPONS TRACKING SYSTEM

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The purpose of this MBA project is to determine how effective the use of radio-frequency identification (RFID) and item unique identification (IUID) can be in Marine Corps armories; the determination is made based on operating procedures, support of key organizations within the Departments of the Navy and the Marine Corps, and current research. The first objective of this project is to examine the involvement, progress, and procedures of organizations that are involved in supporting and improving the Marine Corps' armory processes. The second objective is to explore the feasibility of implementing RFID and/or UID technology into the current Marine Corps small-arms tracking system based on current research. Feasibility and compatibility are determined by examining the existing organizations, current business processes, and information technology systems. The third objective is to examine current research about the use of RFID and UID technology with small arms. The final objective is to provide recommendations for implementing these technologies in the Marine Corps armory system.

KEYWORDS: Radio Frequency Identification, Item Unique Identification, Unique Identification, Marine Corps Small Arms

FORECASTING THE REPAIR DEMAND OF THE F414-GE-400 ENGINE AT NAVAL AIR STATION LEMOORE

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The purpose of this research is to forecast the repair demand of the F414-GE-400 aircraft engine and determine if Fleet Readiness Center (FRC) West, located at Naval Air Station (NAS) Lemoore, will be able to meet increased demand in the near future. The methodology used is to collect the current history of intermediate-level repair of the F414-GE-400 and estimate its increase based on the arrival of additional engines procured by the Navy. The objective of this research is to build an optimization model to determine if present manning levels are adequate to perform the forecasted engine repair demand. The analysis result provides decision makers with information regarding best alternatives to meet increased demand.

KEYWORDS: Fleet Readiness Center, FRC, Forecast, F414-GE-400, F414 Engine, F/A-18E/F/G Aircraft, Super Hornet, Supply Chain Management, SCM, Optimization

SQUADRON MOVEMENT AND ASSOCIATED TRANSPORTATION PROBLEMS: AN INNER LOOK INTO THE PROCESS

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The purpose of this MBA project is to explore the feasibility of prepositioning common aviation-support equipment onboard aircraft carriers. When called upon to conduct shipboard operations, carrier-based squadrons are currently required to transport their common support equipment between their home station and their assigned aircraft carrier via commercially contracted trucks. The determination of prepositioning is made by conducting a cost-benefit analysis of purchasing additional support equipment versus continuing to pay for contracted trucking. The transportation funding program is investigated to determine how it could be executed differently to better track funds and reduce current questionable and unchallengeable charges. The project shows how proper scheduling of trucks for a carrier offload can eliminate detention charges and assist in preventing taxpayer dollars from being used for non-value-added activities.

KEYWORDS: Naval Aviation Enterprise, Distribution Network, Transportation Costs, Material Prepositioning, Inventory Management, Lean 6 Sigma, Detention Charges

AN ANALYSIS OF THE TICONDEROGA CLASS GUIDED MISSILE CRUISERS 1B1B ACCOUNT

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The purpose of this MBA project is to review the current budgeting model and existing ships' Operating Target (OPTAR) data for FY2006 and 2007. The scope of this analysis is limited to the Ticonderoga Class Cruiser (CG) 1B1B OPTAR other consumable (SO) account. The objective of this paper is to analyze the operating costs supporting the funding allocation method used by Commander, Naval Surface Force in support of his stakeholders; and to identify and evaluate the underlying costs and cost drivers in relation to each cruiser's location in the Fleet Response Plan (FRP). An analysis is performed by fiscal year, expense element, federal supply group, and FRP phase in order to find outliers or anomalies with regard to ships' expenditures. Additionally, an examination is conducted to identify expenditure differences between fleets within the cruiser class squadron and in an attempt to understand the spending disparity between Pacific and Atlantic Fleets.

KEYWORDS: OPTAR, Consumable Funding, SO, Federal Supply Group, FSG, Funding Allocation, Fleet Response Plan, FRP, Expense Elements, Cruiser

AN ASSESSMENT OF THE COLLABORATIVE CAPACITY OF THREE ORGANIZATIONS WITHIN DEFENSE ACQUISITION

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In this thesis, Collaborative Capacity Survey results from three defense acquisition organizations are presented. The Collaborative Capacity Survey was developed by Drs. Susan Hocevar, Erik Jansen, and Gail Thomas of the Naval Postgraduate School to identify enablers and barriers to collaboration within an organization. The Collaborative Capacity Survey is a tool designed to provide any organization with a diagnostic process for assessing its collaborative capacity. Results from the Collaborative Capacity Survey could provide participating offices insights into their collaborative strengths and weaknesses as they strive to improve their capacity to collaborate with other organizations.

KEYWORDS: Collaboration, Collaborative Capacity, Inter-Organizational Collaboration, Collaborative Capacity Survey, Defense Acquisition

AN OPERATIONAL UTILITY ASSESSMENT: MEASURING THE EFFECTIVENESS OF THE JOINT CONCEPT TECHNOLOGY DEMONSTRATION (JCTD), JOINT FORCES PROTECTION ADVANCE SECURITY SYSTEM (JFPASS)

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Planning modern military operations requires an accurate intelligence assessment of potential threats, combined with a detailed assessment of the physical theater of operations. This information can then be combined with equipment and manpower resources to set up a logistically supportable operation that mitigates as much of the enemy threat as possible. Given such a daunting challenge, military planners often turn to intelligent software agents to support their efforts. The success of the mission often hinges on the accuracy of these plans and the integrity of the security umbrella provided.

The purpose of this project is to provide a comprehensive assessment of the Joint Forces Protection Advanced Security System (JFPASS) Joint Concept Technology Demonstration (JCTD) to better meet force-protection needs. The research also addresses the adaptability of this technology to an ever-changing enemy threat by the use of intelligent software. Data pertaining to the research, development, testing, and effectiveness of the JFPASS is collected and analyzed. An operational effectiveness model to quantify overall system performance is developed.

KEYWORDS: Joint, Protection, Security, Fusion, Interoperable, BCA, CBRN, Force Protection, System-of-Systems, Intelligent, Software, Agents, Context, COTS, Fusion

AN ANALYSIS OF USING FLEET READINESS CENTERS VICE CIVILIAN CONTRACTORS FOR AIRCRAFT MODIFICATION WORK

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Fleet Readiness Center Southwest (FRCSW) conducts maintenance on various aircraft platforms. In addition to regular aircraft overhauls, FRCSW has the capacity to perform aircraft modifications, which are currently completed by contractors. This project examines why the FRCs are not getting more CH-53E modification work when they have the capacity and capability to complete the work. This project uses FRCSW as a case study to address the issue. Interviews are conducted with the heads of the Multi-Line Division within FRCSW in San Diego, California, and with the Commander of FRCs and the H-53 Assistant Program Manager for Logistics at the Naval Air Systems Command (NAVAIR), Patuxent River, Maryland. The results of these interviews provide an assessment of the actions taken to reduce inefficiencies and non-value-added activities and insight into how NAVAIR selects between contractors and FRCs to complete modification work. The data reveal that FRCSW has the capacity to complete modification work on CH-53 aircraft without schedule slippage. Also, a comparison of labor rate, schedule, and location of work demonstrates how much more expensive FRCSW is and why NAVAIR chooses the lower cost contractor to complete modification work.

KEYWORDS: Fleet Readiness Center Southwest, NAVAIR, PMA-261, CH-53 Modifications

AN EMPIRICAL STUDY OF THE UNITED STATES NAVY'S MANAGEMENT OF SERVICE ACQUISITION

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The Department of Defense is spending an ever-increasing amount on support for the operation of continental United States (CONUS) installations. The purpose of this MBA project is to provide a comprehensive overview of how service acquisitions are managed for United States Navy installations. This project discusses the process of gathering empirical data from a web-based survey created from a previous MBA project (Meinshausen and Compton, 2007) that will be distributed as a tasker from the Office of the Commander of Naval Operations. This survey was conducted between June and July 2008, and covered 87% of the installations found on the regional commands' websites. Also, this MBA project compares the survey results with the concerns of the Government Accountability Office (GAO) in the area of service acquisition management. The results of this research indicate that the majority of the contracts issued at Navy installations are competitive firm fixed price without incentives contracts. The project team approach is used on half of the services contracts awarded for installation services. Additionally, personnel assigned to monitor installation service contracts are only minimal trained resulting in statements of work and statements of objectives not being generated at the requirements level. The results of this project will be used for further research in the area of improvements to installation service acquisitions.

KEYWORDS: Service Acquisition, Empirical Study, Project Team Approach, Acquisition Management, Navy Base Services Acquisition

TRUST, MISTRUST, AND ORGANIZATIONAL DESIGN: UNDERSTANDING THE EFFECTS OF SOCIAL CONFIGURATIONS

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Trust matters for task performance, particularly when the task involves dealing with a potential threat or crisis. When faced with important decisions in such situations, the social connections between managers and front-line employees are critical. Drawing on the concept of trust and organizational design, the authors investigate and provide a comprehensive overview of the effects of trust and mistrust on two different organizational designs. The formation of effective partnerships is influenced greatly by trust. Trust sets the stage for necessary factors for collaboration, such as social interaction, communication, negotiation, and cooperation. The organizations are structured as hierarchies or self-managing teams, also known as Edge organizations. This project analyzes the effects of high and low conditions of trust on two distinct structures of organizations offering insight on the appropriate selection of design structures within varying conditions of trust. The analysis also offers a comparison of each group's performance to determine the most effective structures under certain conditions of trust. It is found that collaborative, sharing practices (an organic, flat environment, Edge) in a trusting organizational climate produce the greatest levels of task performance. When decisions need to be expedited, however, trust is non-significant, and formal relationships between organization members are more salient. The implications for organizing in coalition-type environments and military units are discussed.

KEYWORDS: Edge, Trust, Organizational Design, Hierarchy, Problem Solving

COMBATING THE MILITARY'S ESCALATING PHARMACY COSTS: A LEAN SIX SIGMA APPROACH

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The pharmacy operations of three military medical treatment facilities (MTF) are observed to determine possible process improvements and cost-saving mechanisms that may be achieved through Lean Six Sigma business methodologies. After mapping the processes of each facility (one large, one medium, and one small), each is modeled using discrete event simulation in order to forecast potential savings, increases in efficiency, and/or waste reduction while either maintaining or improving customer satisfaction (i.e., wait times). The research proves that Lean Six Sigma business practices could be implemented within military pharmacy operations, often at little or zero cost, while realizing significant savings and increased customer satisfaction.

KEYWORDS: Lean Six Sigma, Pharmacy, Pharmacy Operations, Military Treatment Facilities, Military Healthcare, Discrete-Event Simulation

NAVAL SURFACE FORCES REAL-TIME REUTILIZATION ASSET MANAGEMENT WAREHOUSES: A COST-BENEFIT ANALYSIS

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CDR Brett A. Wagner, USN, Graduate School of Business and Public Policy

This research examines Naval Surface Forces Real-Time Reutilization Asset Management Warehouse operations and the associated costs and benefits they provide to the Navy. Established cost-benefit analysis techniques are used to provide the Navy with information to determine whether the benefits of storing, inventorying, and providing free-issue parts to customers are worth the costs of operating and maintaining the warehouses. The objective is to focus on total warehouse operating costs and compare these costs to the savings the Navy receives through storing and providing the repair parts. The results can help decision makers determine if the warehouse operations are beneficial as is, should be remodeled to increase benefits, or simply do not cover the associated costs. It is concluded that the warehouses generate an annual cost avoidance of $48 million, direct revenue of $5 million, and fill 2,300 high-priority requisitions.

KEYWORDS: Cost-Benefit, Inventory Management, Warehouse Costs, Inventory Costs

USING "CLICKERS" IN THE CLASSROOM TO INCREASE THE LEVEL OF STUDENT INTERACTION

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Master of Business Administration–December 2008
Advisors: Douglas E. Brinkley, Graduate School of Business and Public Policy
Lisa L. Massi Lindsey, Graduate School of Business and Public Policy

Interaction is crucial in classrooms because increased interaction is linked to increased learning. Past studies report that students learn through a myriad of methods, and that it is up to the instructor to promote as many means as possible to transport the material to the students. One way in which instructors are providing information to their students is through a classroom response system (CRS), an electric transponder the size of a remote control. The CRS allows users to respond and interact with the push of a button.

This study looks at educational institutions using CRS in order to identify the distinctive characteristics that are analyzed to value its effectiveness in a classroom environment. The information collected is examined to gain an understanding of the various uses of CRS to determine if they would be a beneficial addition to resident Naval Postgraduate School curriculums.

Also, this study employs a post-test-only, independent groups, quasi-experimental design to test the effects of clickers in the classroom. Specifically, clicker use is studied to determine what impact, if any, their use would have on student interaction in the classroom, student engagement, student motivation, perceived teacher immediacy, course liking, and students' overall evaluation of the clickers. The findings and implications of this study are discussed.

KEYWORDS: Communication, Student Motivation, Perceived Teacher Immediacy, Student Engagement, Clickers, Classroom Response Systems

CIVIL ENGINEER CORPS ACCESSIONS: FORECASTING INTERVIEW REQUIREMENTS AND TRAVEL BUDGETS

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The purpose of this MBA project is to provide insight into interview requirements and travel budgets for the Civil Engineer Corps accessions team through the use of forecasting. The goal of this project is to provide a forecasting model that can predict interview requirements and form the basis for constructing travel budgets and estimates. The primary tool utilized is spreadsheet modeling, including extensive linear regression analysis. Additional insight is provided into the application of this model and the extracted data with respect to management controls.

KEYWORDS: Civil Engineer Corps, CEC, Forecasting, Linear Regression Analysis, Management Controls, Spreadsheet Modeling

MANAGEMENT AND OVERSIGHT OF SERVICES ACQUISITION WITHIN THE UNITED STATES AIR FORCE

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Master of Business Administration–December 2008
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Rene G. Rendon, Graduate School of Business and Public Policy
Second Reader: Uday Apte, Graduate School of Business and Public Policy

The purpose of this MBA project is to review the policies and practices of the United States Air Force (USAF) in the area of service acquisition and oversight. Additionally, this research discusses Government Accountability Office (GAO) concerns in the area of service acquisition and oversight. The survey employed herein is taken from a prior Naval Postgraduate School MBA project (Meinshausen and Compton) and distributed to 50 Contracting Squadron Commanders across seven separate Air Force Major Commands (MAJCOMs). The researchers conducted the survey between mid-June and mid-July 2008 and received a 68% response rate. The research shows that contracting officers are serving in the capacity as program managers for a majority of service acquisitions at the installation level. Additionally, this research shows that a majority of contracting squadron leadership identifies manning as a major issue for their organization. The results of this project will be used for further research in the area of lifecycle management of service acquisitions.

KEYWORDS: Service Contracting, Life-Cycle Management, Strategic Sourcing, Quality Assurance Contractor Oversight

OPTIMUM ROUTE-PLANNING AND SCHEDULING FOR UNMANNED AERIAL VEHICLES

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Senol Kurt–First Lieutenant, Turkish Air Force
Master of Business Administration–December 2008
Advisor: Aruna U. Apte, Graduate School of Business and Public Policy
Second Reader: Susan K. Heath, Graduate School of Business and Public Policy

New threat perceptions have extended the sense of self-defense to include preemptive strikes if a threat is going to occur. For its part, the military should have high intelligence, surveillance, and reconnaissance (ISR) capabilities to implement this strategy. Unmanned aerial vehicles (UAVs) play an important role as

the most effective way of providing high-quality ISR in today's modern wars. The route planning of UAVs is the most critical and challenging problem of wartime.

Three algorithms are developed to solve a model that produces executable routings in order to dispatch three UAVs to complete 20 different missions in different locations. These algorithms seek to maximize the bonus points that are paired with the targets, representing the priority of the missions. By this definition, the problem can be classified as a Multiple Tour Maximum Prize Collection Problem (MTMPC). MTMCP is closely related to the classical Traveling Salesman and Vehicle Routing Problems, with the difference that not all nodes can be visited in the available time. Each node is assigned a bonus point value representing the priority of that mission, and the objective of the MTMCP is to determine the nodes to be visited to maximize the collected bonus points.

KEYWORDS: UAV, Unmanned Aerial Vehicle, Multiple Tour Maximum Prize Collection Problem, MTMPC, Orienteering Problem, OP, Team Orienteering Problem, TOP, Traveling Salesman Problem, TSP, Battle Damage Assessment, BDA, ISR, Intelligence Surveillance and Reconnaissance, Vehicle Routing Problem, VRP

AN EVALUATION OF THE DEPARTMENT OF THE NAVY'S MANAGER'S INTERNAL CONTROL MANUAL

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Master of Business Administration–December 2008
David A. Kobie–Captain, United States Marine Corps
Master of Business Administration–December 2008
Dale A. Haney–Lieutenant, United States Navy
Master of Business Administration–December 2008
Advisors: Kenneth J. Euske, Graduate School of Business and Public Policy
CAPT Lisa Potvin, USN, Graduate School of Business and Public Policy

The purpose of this MBA project is to conduct a comprehensive review of the current Department of the Navy Manager's Internal Control (MIC) Manual to evaluate its effectiveness in helping to align the Navy's current mission, organizational philosophy, management strategy, goals, metrics, sustainment efforts, and improvement programs. Additionally, this study reviews the MIC Manual to evaluate its ease of use and to identify potential challenges in applying the concepts as outlined in the manual. The primary framework used in evaluating the MIC Manual is a report published by the Government Accountability Office (GAO), entitled *Internal Control Management and Evaluation Tool (2001)*, which is based upon the five standards for internal control in the federal government. Although the MIC Manual provides an interpretation of the guidance and requirements set forth by SECNAVINST 5200.35E, the manual falls short in transcending or translating the spirit and intent of SECNAVINST 5200.35E and other statutory and regulatory references. The MIC Manual's ease of use is hindered due to the strict focus on providing instructional guidance in adhering directly to the requirements of SECNAVINST 5200.35E alone. Additionally, it is challenging for the reader to grasp the purpose and vision of the program given that the overarching organizational goals and objectives are not clearly stated within the manual. Structuring the MIC Manual to reflect the GAO's five standards of internal control will increase its effectiveness in aligning an organizations' current mission, organizational philosophy, management strategy, goals, metrics, sustainment efforts, and improvement programs.

KEYWORDS: Managers' Internal Control Manual, MIC Manual, Managers' Internal Control Program, MIC Program, Internal Control, IC, Internal Control Systems, GAO's Internal Control Management and Evaluation Tool, GAO Tool, Internal Control Standards, Internal Control Components, Federal Government, Internal Control Defined, Limiting Factors

DEMAND RESPONSE AT THE NAVAL POSTGRADUATE SCHOOL

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Daryl Wilson–Lieutenant, United States Navy
Master of Business Administration–December 2008
Advisors: Geraldo Ferrer, Graduate School of Business and Public Policy
Nicholas Dew, Graduate School of Business and Public Policy

The purpose of this MBA project is to assist the Naval Postgraduate School's Public Works Department to assimilate into a Demand Response Program that will benefit both the school and the community. Demand Response Programs are open to any residential or business customer that is tied into a local power grid. Through varying Demand Response Programs, the Naval Postgraduate School has the potential to help the local power grid by curtailing energy consumption during peak times; in return benefiting from rebates and support services that can help to adopt better energy saving practices.

KEYWORDS: Demand Response, Real Time Pricing, Critical Peak Pricing, Time of Use, Curtailable Rate Programs, Energy Efficiency

REVERSE LOGISTICS AT THE COMMANDER, NAVAL SURFACE FORCES REAL-TIME AND REUTILIZATION ASSET MANAGEMENT (R-RAM) SAN DIEGO WAREHOUSE

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Jeffery Young–Lieutenant Commander, United States Navy
Master of Business Administration–December 2008
Dennis Estrella–Major, Philippine Air Force
Master of Business Administration–December 2008
Advisor: Uday Apte, Graduate School of Business and Public Policy
Second Reader: CDR Richard Nalwasky, USN, Graduate School of Business and Public Policy

The purpose of this MBA project is to evaluate and assess the inventory management database at the Commander, Naval Surface Forces (CNSF) Real-Time Reutilization Asset Management (R-RAM) San Diego warehouse. CNSF spends approximately $4 million annually for contractor support to operate the R-RAM warehouses for the Atlantic and Pacific surface fleets, and in return, receives cost-avoidance for spares issued from the warehouses. The warehouses contain A-condition spare parts that were offloaded from decommissioned ships, as well as excess inventory from afloat units. Spare parts in the R-RAM warehouses were procured either by using the initial outfitting allowance or by operations and maintenance (O & M) funds. The spare part is issued free to the requesting ship. The R-RAM inventory is visible to customers through the Global Distance Support Center and various databases. The goals of this study of the R-RAM inventory management database are to determine ways to increase throughput while simultaneously reducing inventory and operating expense, reduce inventory footprint by identifying "dead" stock and obsolete spares, recommend a stocking policy, and develop recommendations for current and future operations.

KEYWORDS: Reverse Logistics, R-RAM, Inventory Management, Warehouse Consolidation

ADAPTING E-MANAGEMENT TO SUPPORT GEOGRAPHICALLY DISPERSED MILITARY TRAINING

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Magdi Kamel, Department of Information Sciences

This thesis reports on the results to date in supporting managerial decisions concerning training as a part of organizational learning. Training is one of the most important factors in sustaining and expanding an organization's comparative advantage by reinforcing knowledge-flow among its members. On the other hand, training is downgraded when it jeopardizes personal incentives, such as bonuses, production goal achievement, and financial accomplishment in the private sector. In a similar way, nearly all military personnel are assigned collateral duties – many of which are very important – but for which many such personnel cannot engage in adequate training to properly accomplish. Four web-based decision systems are evaluated to determine how well they can support training among geographically dispersed military units. In particular, because much of the important knowledge associated with training is tacit in nature, how such tacit knowledge can flow effectively and efficiently via the network technologies underlying e-management is important to investigate. The duty of on-scene leader for shipboard firefighting is chosen as a suitable training focus. The multimedia systems are evaluated via a multi-criteria multi-expert analysis. Criteria are drawn from the appropriate literature, while Naval Postgraduate School officers with appropriate experience serve as experts.

KEYWORDS: Training, e-Management, Organizational Learning, Tacit Knowledge, Adobe Director, MetaCard, SuperCard, i-Think, PowerSim, Web-Based Decisions Systems

MASTER OF SCIENCE

Applied Mathematics
Applied Physics
Astronautical Engineering
Combat Systems Technology
Computer Science
Contract Management
Defense Analysis
Electrical Engineering
Electronic Warfare Systems Engineering
Engineering Acoustics
Engineering Science
Human Systems Integration
Information Operations
Information Systems and Operations
Information Warfare Systems Engineering
Management
Mechanical Engineering
Modeling, Virtual Environments, and Simulation
Operations Research
Physical Oceanography
Physics
Program Management
Software Engineering
Systems Engineering
Systems Engineering Analysis
Systems Technology

MASTER OF SCIENCE
IN
APPLIED MATHEMATICS

THE TRANSIENT EFFECTS OF POLYMER-ORGANIC LIGHT-EMITTING DIODES AND THEIR IMPACT ON INDIVIDUAL IDENTIFICATION FRIEND/FOE

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Second Reader: Pete Crooker, Department of Physics

The Individual Identification Friend/Foe (IIFF) patch is a unique system designed to prevent shooter-on-shooter fratricide in a battlefield environment. Using a Polymer-Organic Light-Emitting Diode (p-OLED) as the emitter for the IIFF system provides many unique opportunities and challenges in system design. Both high overall brightness in the infrared (700-900 nm) region and fast turn-on time (e.g., the time it takes from application of bias voltage to full intensity of the emitter) are important for the IIFF system to be successful.

In this thesis, six p-OLED candidates are tested for potential use in the IIFF device. The best candidate is determined to be a mixture of two different ink formulations (4:1; Yellow:Red) combined with an updated cathode design. This provides a 410% increase in brightness and faster turn-on compared to the original Covion Yellow emitter in the infrared.

This thesis also includes initial research on material properties of the p-OLED that determine the key factors that went into material selection. P-OLEDs differ from inorganic semiconductors in that the p-n junction is created after a bias voltage is applied, and the width of the p-i-n regions varies with the bias voltage applied to the material. Two distinct, transient effects during turn-on are determined, and the turn-on intensity as a function of time is able to be modeled as an exponential rise-to-maximum function with two exponential time constants, one on the order of 1 s and the other on the order of 10 s.

KEYWORDS: LEP, p-OLED, Conjugated Polymer Organic Light Emitting Diode, IFF, IIFF, Transient Behavior

SPECTRAL GRAPH THEORY OF THE HYPERCUBE

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Second Reader: Ralucca Gera, Department of Applied Mathematics

In Graph Theory, every graph can be expressed in terms of certain real symmetric matrices derived from the graph, most notably the adjacency or Laplacian matrices. Spectral Graph Theory focuses on the set of eigenvalues and eigenvectors, called the *spectrum*, of these matrices and provides several interesting areas of study. One of these is the *inverse eigenvalue problem* of a graph, which tries to determine information about the possible eigenvalues of the real symmetric matrices whose pattern of nonzero entries is determined by a given graph. A second area is the *energy* of a graph, defined to be the sum of the absolute values of the eigenvalues of the adjacency matrix of that graph.

This thesis explores these two areas for the hypercube Q_n, which is formed recursively by taking the Cartesian product of Q_{n-1} with the complete graph on two vertices, K_2. The thesis analyzes and compares several key ideas from the inverse eigenvalue problem for Q_n, including the maximum multiplicity of possible eigenvalues, the minimum rank of possible matrices, and the number of paths that occur both as induced subgraphs and after deleting certain vertices. The thesis concludes by deriving several equations for the energy of Q_n.

KEYWORDS: Spectral Graph Theory, Hypercube, Adjacency Matrix, Laplacian Matrix, Spectrum, Eigenvalues, Inverse Eigenvalue Problem, Maximum Multiplicity, Minimum Rank, Path Cover Number, Energy of a Graph

EFFICIENT IMPLEMENTATION OF FILTERING AND RESAMPLING OPERATIONS ON FIELD-PROGRAMMABLE GATE-ARRAYS FOR A SOFTWARE DEFINED RADIO

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In software defined radios, a good portion (or even the entirety) of the modulation and demodulation processes is performed in the digital domain. The data rate of the transmitted information is very important, because efficiency is a key requirement in real-time implementations and cost increases considerably with the number of samples-per-second to be processed. This thesis addresses the problem of efficient design of the resampling operations so that they can be implemented on field-programmable gate-arrays (FPGAs).

A set of filtering and resampling operations is developed in the Simulink environment through Xilinx/Simulink blocksets, where all the included subsystems of the design are fully accessible by the designer in any stage of operation. The key ingredient is the use of a Multiplier and Accumulator architecture, which can be either time-multiplexed for maximum hardware efficiency or run on a parallel structure for maximum time efficiency.

KEYWORDS: Digital Signal Processing, Software Defined Radio, Field Programmable Gate Array, Resampling, Filtering, Xilinx, System Generator

MASTER OF SCIENCE
IN
APPLIED PHYSICS

ADAPTIVE FILTER TECHNIQUES FOR OPTICAL BEAM JITTER CONTROL

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The objective of this research is to develop advanced control methods to attenuate laser beam jitter using a fast-steering mirror. Adaptive filter controllers using Filtered-X Least Mean Square (FX-LMS) and Filtered-X Recursive Least Square (FX-RLS) algorithms are explored. The disturbances that cause beam jitter include mechanical vibrations on the optical platform (narrowband) and atmospheric turbulence (broadband). Both feedforward filters (with the use of auxiliary reference sensor(s)) and feedback filters (with only output feedback) are investigated. Hybrid adaptive filters, which are a combination of feedback and feedforward, are also examined. For situations when obtaining a coherent feedforward reference signal is not possible, methods for incorporating multiple semi-coherent reference signals into the control law are developed. The controllers are tested on a jitter control testbed to prove their functionality for beam pointing at static and dynamic targets. The testbed is equipped with shakers mounted to the optical platform and a disturbance fast-steering mirror to simulate the effects of atmospheric propagation. Experimental results show that the developed control laws (multiple reference feedforward, feedback and hybrid) have superior performance to the fully coherent reference feedforward adaptive filter controller.

KEYWORDS: Adaptive Filter, Filtered-X, Least Mean Square, Recursive Least Square, Jitter Control, Beam Control, Target Tracking, Beam Pointing

REAL-TIME IMAGING ANALYSIS USING A TERAHERTZ QUANTUM CASCADE LASER AND A MICROBOLOMETER FOCAL PLANE ARRAY

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Scott Davis, Department of Physics

It is widely published that the terahertz (THz) spectral range has potential for imaging in the fields of military and security applications. The Sensors Research Laboratory previously achieved real-time imaging of concealed objects using a 1mW quantum cascade laser (QCL) and an uncooled vanadium oxide/silicon nitride-based microbolometer. This thesis introduces an amorphous silicon-based microbolometer with improved NETD in the 8-12 □m infrared spectral range. The QCL is usually operated in pulsed mode with rate in the hundreds of kHz, which is much higher than the cut-off frequency of microbolometers of about tens of Hz. This indicates that neither camera should be able to detect the individual pulses of the THz beam. A detailed analysis shows that microbolometers can only detect the average power. Earlier experiments are reproduced using the amorphous silicon-based camera to assess the image quality, but it is found to be inferior to the silicon nitride-based camera. These observations indicate that the absorption of THz in amorphous silicon is much weaker than silicon nitride. Other materials used to conceal military assets are analyzed and imaged to prove, in principle, the possibility of active THz imaging detection at a distance in narrow atmospheric windows.

KEYWORDS: THz, Microbolometer, Uncooled, Quantum Cascade Laser, Imaging, Detection, Camera, NETD

A SPECTRAL ANALYSIS OF ULTRAVIOLET (UV) CLUTTER SOURCES TO IMPROVE PROBABILITY OF DETECTION IN HELICOPTER UV MISSILE-WARNING SYSTEMS

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The purpose of this research is to thoroughly examine three representative sources of ultraviolet (UV) clutter that are known to degrade the performance of current aircraft missile warning systems (MWS). The experiment conducted is intended to develop a thorough understanding of the UV, visible, and near-infrared emissions of the three UV sources. The collected data is analyzed to identify common spectral characteristics of all clutter sources that may allow for improved clutter rejection by current and future MWS. Additionally, spectral-band intensity ratios are generated from the collected data to demonstrate that such ratios can, in principle, be utilized to discriminate between threat missiles and background clutter to improve MWS probability-of-detection (P_d) and further reduce the false-alarm rate. The three UV sources selected as clutter emissions are a spark discharge gap and a corona discharge gap, both with variable gap length and variable material electrodes, and an arc welder. The results of this study provide a thorough summary of the emissions from these sources from 200 nm to 893 nm. It is demonstrated that spectral rejection by focusing the MWS in a narrower spectral band is unlikely to increase P_d. It is further demonstrated that spectral ratio discrimination is sound in principle. This thesis presents and analyzes potential solutions to assist designers and program managers in improving currently fielded and developing aircraft survivability equipment.

KEYWORDS: Ultraviolet, UV, Missile Warning System, MWS, Infrared Countermeasures, IRCM, PFAS, MANPADS, Survivability, Helicopters, Rotary Wing, Spectrometry, Chemilluminescence

EXTRACTING HIDDEN TRAILS AND ROADS UNDER CANOPY USING LIDAR

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Master of Science in Applied Physics–December 2008
Prokopios Krougios–Lieutenant Junior Grade, Greek Navy
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Master of Science in Electronic Warfare Systems Engineering–December 2008
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The field of remote sensing has greatly benefited from the development of LIDAR. The extraction of bare earth under tree canopies, especially the identification of hidden trails, is an important tool for military and civilian operations in dense forests. LIDAR data from the Sequoia National Park in California (2008) and the Fort Belvoir Military Base in Virginia (2007) are two areas selected for analysis. Quick Terrain Modeler software is used to recognize hidden trails. The entire procedure is followed by ground-truth verifications in Sequoia National Park, and all necessary preparations for analysis of the Fort Belvoir data are studied. The ground-truth results in Sequoia are promising, and the analysis of the Fort Belvoir data is encouraging for further development of the system. Trails with a width less than 2 m are easily recognized in Fort Belvoir during the analysis of the data, which affirms the high accuracy of the sensor. In the Sequoia area, only paved trails with a width less than 1.5 m are identified.

KEYWORDS: Lidar, Ladar, Laser Radar, Foliage Penetration, FOPEN, Poke-Through, Terrain Analysis, Trails, Sequoia National Park, Fort Belvoir Virginia, Hidden Trails, Quick Terrain Modeler, Lidar Accuracy, Lidar Error

"PROBABLE CAUSE" FOR MARITIME INTERDICTIONS INVOLVING ILLICIT RADIOACTIVE MATERIALS

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Master of Arts in Security Studies–December 2008
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James C. Moltz, Department of National Security Affairs

Existing international frameworks that govern maritime interdiction entitle the boarding of a vessel in international waters only if justified by reasonable grounds to suspect that the vessel is engaged in illicit activity, a legal concept similar to the U.S. principle of "probable cause." Given recent advances in radiation-detection technology, this thesis considers how this concept could be strengthened by the use of detectors for maritime interdiction of illicit radioactive materials, a problem that spans both policy and technical issues. To address this problem, the thesis incorporates analysis of both legal and technical factors related to detection of illicit radioactive materials. The thesis includes a comprehensive compilation and examination of the legal and institutional issues related to probable cause determination. Technical evaluations of the Adaptable Radiation Area Monitor (ARAM), a state-of-the-art, remote radiation-detection system, are provided to determine its suitability in supporting probable cause determinations in a maritime environment. Based on these technical evaluations and an understanding of the legal and institutional issues related to probable cause determination, it is concluded that radiation-detection technology offers great promise in promoting effective interdiction operations, which will improve safety and reduce the risk of illicit transport of radioactive materials.

KEYWORDS: Probable Cause, Maritime Interdictions, Nuclear and Other Radioactive Materials, Radiation Detection and Identification, Law of the Sea, Conventional and Customary International Law, Proliferation Security Initiative, PSI, NATO Operation Active Endeavour, SUA Convention, War on Terrorism, Belligerent Status, Doctrine of Self-Help, Doctrine of Necessity, Doctrine of Pre-Emptive or Anticipatory Self-Defense, Scintillation Detectors, Gamma/X-Ray Interactions, Spectroscopy, Photoelectric Absorption, Compton Scattering, Pair Production, Detector Counting Efficiency, Adaptable Radiation Area Monitor, ARAM

THZ-IMAGING THROUGH-THE-WALL USING THE BORN AND RYTOV APPROXIMATION

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Second Reader: Gamani Karunasiri, Department of Physics

In this thesis, an inverse imaging problem is investigated by applying the Rytov approximation for through-the-wall imaging using THz waves. Properties of THz waves and the physical conditions for THz imaging in matter are studied. Maxwell's equations are used to derive a model for the transmission of Green's functions, and a Lippman-Schwinger integral equation and Rytov approximation are used to predict the scattered field. The L-curve method for the selection of regularization parameters is applied; the reconstruction algorithm is presented; and the result is illustrated with numerical simulations. This result is compared to the one obtained by the Born approximation.

KEYWORDS: Terahertz, Imaging, Born/Rytov Approximation, Tikhonov Regularization, L-Curve Method

PULSE-MODE LIGHT SENSING USING FOUR-LAYER SEMICONDUCTOR STRUCTURES AND THEIR APPLICATION IN ARTIFICIAL NEURAL NETWORKS

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Murali Tummala, Department of Electrical and Computer Engineering

Existing semiconductor photodetectors produce a steady current or voltage output in response to incident light that depends on the intensity of the light beam. In contrast, biological vision systems produce a stream of pulses with pulse rate representing the amount of incident light power. The goal of this thesis is to explore the use of a four-layer PNPN semiconductor structure as an optical detector that produces pulses instead of steady current or voltage output. The first task of this thesis is to show that the pulse interval distribution is dependent on the intensity of the incident light beam, and that the distribution of pulse intervals is described by a renewal process statistical model. The second task of this thesis is to use the unique characteristics of the pulse generating circuit, along with a neural network, to construct a 2D sensor array capable of recognizing visual patterns and thus modeling, to some extent, the human visual cortex.

KEYWORDS: Thyristor, SCR, Pulse Mode Operation, Poisson Process, Renewal Process, Neural Networks, Back Propagation, Pattern Recognition

MASTER OF SCIENCE
IN
ASTRONAUTICAL ENGINEERING

REDUCED PRECISION REDUNDANCY APPLIED TO ARITHMETIC OPERATIONS IN FIELD-PROGRAMMABLE GATE-ARRAYS FOR SATELLITE CONTROL AND SENSOR SYSTEMS

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Master of Science in Astronautical Engineering–December 2008
Master of Science in Electrical Engineering–December 2008
Advisors: Brij N. Agrawal, Department of Mechanical and Astronautical Engineering
Herschel H. Loomis, Department of Electrical and Computer Engineering
Second Reader: Alan A. Ross, Department of Electrical and Computer Engineering

This thesis examines two problems in on-board computing for space vehicles and develops rules for applying reduced precision redundancy (RPR) as a new method of fault tolerance in field-programmable gate-arrays against single event effects due to radiation on orbit. RPR was discovered by Snodgrass in 2006 and was first demonstrated using the single-input CORDIC algorithm. This research applies RPR to elementary multiple-input arithmetic operations (addition, subtraction, multiplication, division) and extends applications to multi-level combinations of these operations as they appear in spacecraft subsystems, specifically, communication and attitude determination and control. Further modeling and simulation work explores the impact of varying levels of reduction in precision on the performance of communication and control systems using RPR. Finally, a higher-fidelity dynamics model and control system are developed for the Naval Postgraduate School Bifocal Relay Mirror Spacecraft simulator, and potential application points for selective redundancy using RPR are identified.

KEYWORDS: Reduced Precision Redundancy, Fault Tolerance, SEU, SEE, FPGA, On-Board Processing, Radiation Effects, Software Defined Radio, FFT, Butterfly Operator, ADCS, Flexible Structure, LQG Control, BRMS, Reprogrammable Computers

MASTER OF SCIENCE
IN
COMBAT SYSTEMS
TECHNOLOGY

NEAR-FIELD SCANNING OPTICAL MICROSCOPY OF NANO-DEVICES

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Master of Science in Combat Systems Technology–December 2008
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This thesis investigates the optical properties of nano-devices using the technique of near-field scanning optical microscopy (NSOM). A unique set-up to perform atomic force microscopy (AFM) and NSOM simultaneously in a scanning electron microscope (SEM) to collect spatially resolved luminescence and image transport on nano-scale structures, particularly nanowires, will allow direct determination of transport parameters, such as minority carrier mobility and diffusion length, that are vital to the performance of optoelectronic devices.

The work involves the development of a unique nano-scale imaging technique applicable to a wide range of structures. The main structures of interest in this thesis are GaN nanowires. Instead of using a laser for generating charge for imaging, the e-beam from the SEM is used to generate localized charge for an NSOM probe to monitor the motion of the excess charge due to diffusion and/or drift via the electron-hole recombination process. For the first time in this research, the author addresses numerous challenges such as the intricate NSOM technique to resolve sub-wavelength dimension measurements of the elements and determine optimized experimental parameters to compensate for the relatively low efficiency of NSOM optical collection. Of significance, transport imaging of 1-10 μm long GaN nanowires results in minority carrier diffusion lengths ranging from 1-2 μm.

An initial experimental exploration is also conducted to determine the theoretical prediction of the unique transmission enhancement of Au nanobowties fabricated on a luminescent GaAs heterostructure.

The author discusses the working principles, experimental procedures, optimal process parameters, and respective imaging results for assessing the properties of the nano-devices studied in this thesis work. Recommendations for future research pertaining to the augmentation of related NSOM work are included to ensure continued progress in this area.

KEYWORDS: Diffusion, Direct Transport Imaging, Minority Carrier Lifetime, Minority Carrier Mobility, GaN Nanowires, Nanobowties, Cathodoluminescence, Near Field Scanning Optical Microscope, Atomic Force Microscope

AN INVESTIGATION OF NEW MATERIALS AND METHODS OF CONSTRUCTION OF PERSONNEL ARMOR

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There has been a considerable amount of research done over the years on personnel and vehicle armor. However, much of this work has focused on finding materials that were very "strong" and able to resist penetration of objects moving at high velocity. New armor concepts, constructed using fundamental shock-physics methods, are studied in this thesis. The goal of this research is to develop materials concepts through the understanding of shock physics that will lead to new armor concepts for personnel.

It is envisioned that initial concepts will be developed from theoretical arguments, but with the aid of computational tools, such as hydrocodes. The approach used in this research is to define materials theoretically that have desirable properties and put these materials together into a computer model.

It is also envisioned that at a minimum, a four-layered approach is required. Currently, the concept is composed of an initial, high-impedance layer, which will serve to minimize the shock transmitted from an incoming blast wave. Additional layers are then optimized to stop projectile penetration. The second layer is envisioned to be able to quickly spread the energy from impact laterally, coupled with a slow through-thickness sound-speed for slowing down the shock wave. The third layer is then used to absorb energy much more effectively and transform kinetic energy into heat. If a fragment is still able to penetrate through layers one, two, and three, it is essential to have a fourth layer with very high strength to provide a final attempt at stopping any penetrator.

Results of this approach to a particular impact problem are presented. It is clear from the results that these ideas have merit.

KEYWORDS: High Impedance, Wave-Spreading, Porous, Personnel Armor

AN ANALYSIS OF POINT-SPREAD FUNCTION FOR IMAGING MOVING TARGETS FROM SCATTERED WAVES

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Radar imaging is an area of tremendous interest, as radar-based systems are perhaps the only all-weather, long-range, remote-sensing systems. However, radar's continued utility and application in wide-ranging areas is fundamentally dependent on the ability to produce high-quality, artifact-free imagery. To date, the use of radar to identify and image moving objects remains of great interest, and it is well known that motion in the scene gives rise to mispositioning or streaking when target motion is not addressed. Many techniques have been developed to handle moving objects, but these techniques make use of the start-stop approximation, in which a target in motion is assumed to be momentarily stationary while it is being interrogated by a radar pulse.

A new linearized-imaging theory that combines the spatial, temporal, and spectral aspects of scattered waves has been developed. This thesis studies the performance of this new imaging scheme via an analysis of the point-spread function (PSF). It is shown that the imaging PSF localizes and is translation invariant in phase-space. It is also shown that the behavior of the imaging system is dependent on the aperture geometry and choice of radar waveforms transmitted.

KEYWORDS: Radar Imaging, Moving Targets, Point-Spread Function

MASTER OF SCIENCE
IN
COMPUTER SCIENCE

DATA ACQUISITION FROM VOLATILE MEMORY: A MEMORY ACQUISITION TOOL FOR MICROSOFT WINDOWS VISTA

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The focus of this research is on extracting data from the volatile random access memory (RAM) on a personal computer running Microsoft's Windows Vista operating system, while minimally affecting the existing data. The projected work includes the development of a kernel-mode device driver with the capabilities on one or more versions of Microsoft Windows Vista, a user-mode application that interacts with the driver, usage documentation and outcome of the research.

The main objectives of this research are to show the possibility of extracting information from the random access memory using a user mode application (with a suitable driver already installed), and to document the process of Windows Vista driver development so that future work in this area can benefit by putting more effort into specific research, rather than configuring a development environment.

KEYWORDS: Windows Vista Memory Acquisition, Computer Forensics, Device Driver

SECURITY MODELING AND CORRECTNESS PROOF USING SPECWARE AND ISABELLE

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Security modeling is the foundation to formal verification, which is a core requirement for high-assurance systems. This thesis explores how security models can be built in a simple and expressive manner using the Metaslang specification language in Specware. The models are subsequently translated, via the Specware to Isabelle Interface, to be proven for correctness in Isabelle, which is a generic, interactive theorem-proving environment. It is found that the translation between Specware and Isabelle is almost seamless, and there is much potential in the use of Isabelle/HOL to discharge proof obligations that arise in developing Specware specifications, although the actual proving requires substantial knowledge and experience in logical calculus.

KEYWORDS: Formal Method, Theorem Prover, Monads, Specware, Isabelle, LPSK

A FORENSIC ANALYSIS OF WINDOWS VIRTUAL MEMORY INCORPORATING THE SYSTEM'S PAGE-FILE

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Computer forensics is concerned with the use of computer investigation and analysis techniques in order to collect evidence suitable for presentation in court. The examination of volatile memory is a relatively new but important area in computer forensics. More recently, criminals are becoming more forensically aware and are now able to compromise computers without accessing the hard disk of the target computer. This means that the traditional incident-response practice of pulling the plug will destroy the only evidence of the crime. While some techniques are available for acquiring the contents of the main memory, few exist that can analyze these data in a meaningful way. One reason for this is how memory is managed by the operating system. Data belonging to one process can be distributed arbitrarily across physical memory or the hard disk, making it very difficult to recover useful information. This report focuses on how these disparate sources of information can be combined to give a single, contiguous address space for each process. Using address translation, a tool is developed to reconstruct the virtual address space of a process by combining a physical memory dump with the page-file on the hard disk.

KEYWORDS: Computer Forensics, Page-File, Virtual Memory

MASTER OF SCIENCE
IN
CONTRACT MANAGEMENT

AN ANALYSIS OF THE DEPARTMENT OF DEFENSE CONTRACT SPECIALISTS' JOB ENVIRONMENT

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This project examines the current trends in Department of Defense acquisition that are impacting the 1102 Contract Specialist career field. These trends include quantity of work, size of the workforce, and complexity of the work. In each subject area, the researchers review current statistics then analyze associated issues. Lastly, the researchers provide recommendations to increase contract expertise, standardize contracting tools, and better integrate the acquisition workforce.

KEYWORDS: Acquisition Workforce, Contract Specialist

MASTER OF SCIENCE
IN
DEFENSE ANALYSIS

WINNING BODIES AND SOULS: STATE BUILDING AND THE NECESSITY OF NATIONALISM

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This thesis argues the obvious, but still widely neglected point that for successful state building to occur in the post-Cold War era, nationalism remains a necessary, but not sufficient condition for the emergence of a stable, modern nation-state. Nationalism is both the key to state building and the central element in any explanation of the limitations of the modern nation-state and the system of sovereign nation-states in the early 21st century. Without a genuinely unifying nationalism and a strong sense of national identity, underpinned by the provision of goods and services, a modern nation-state is nothing but an ineffective, bureaucratic edifice masquerading as a modern, sovereign nation-state. Despite the post-Cold War resurgence in the theory and practice of state building (or nation building), the crucial role of nationalism receives virtually no attention. The term "nationalism" is used here in the deepest sense possible: it is not being used to describe a superficial agreement that "we are all Iraqis now" or "all Afghanis now" because "we" elected a new government, usually under the auspices of the United Nations and ostensibly responsible for the "national" territory within which "we" live. The central point of this thesis is that despite its apparent obviousness, nationalism remains completely marginalized in the contemporary debate about the theory and practice of state building. To put it in anthropomorphic terms, contemporary exercises in state building (or nation building) are wittingly, or unwittingly, facilitating the creation of a body (the "state") without a soul (the "nation").

KEYWORDS: Nationalism, State Building, Nation Building, National Identity, Nation-State

POPULATION ANALYSIS: A METHODOLOGY FOR UNDERSTANDING POPULATIONS IN COUNTERINSURGENCY ENVIRONMENTS

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This thesis outlines a methodology for use by tactical operators to better understand the dynamics of the population whose support they are attempting to gain. In turn, these operators (Army soldiers, Marines, Special Forces, SEALs, Civil Affairs, etc.) can use this information to more effectively develop strategy, plan operations, and conduct tactical missions. The methodology provides a heuristic model, called the "3 x 5 P.I.G.S.P.E.E.R. Model," that can be applied in any environment and will help bridge the gap between strategic theory and tactical implementation. It is believed that this methodology can be utilized to increase the operator's understanding of the environment and improve both non-kinetic and kinetic combat operations. As a counterinsurgency (COIN) force progresses from kinetic combat operations (those attempting to gain a security foothold in a non-permissive environment) to operations focused on gaining

the support of the population, this methodology will aid in collecting human intelligence (HUMINT). The methodology shows that by providing security, working through locals, building trust and cooperation, and identifying opportunities to leverage the local populace's needs, COIN forces will be able to separate the populace from the insurgents, precisely target the insurgents, and empower the locals to handle their own security.

KEYWORDS: COIN, Insurgency, Counterinsurgency, People's War, Guerrilla War, Terrorism, Population Needs and Motivation, Group Affiliation, Population Subgroup, Tactical, Human Intelligence, HUMINT

IRAN: THE POST-REVOLUTIONARY EVOLUTION

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Following the 1979 Iranian revolution, Ayatollah Khomeini and his followers established a complicated and paradoxical government that combined an authoritative, theocratic government with democratic underpinnings. Although the structure of the government has remained relatively unchanged for almost three decades, the government's bureaucracy and policies have experienced an ongoing evolutionary process that has given rise to three distinct shifts, with radicals, reformists, and conservative hard-liners taking turns steering the country and pressing different agendas. These three shifts present an interesting puzzle: given the strict authoritative nature of Iran's theocratic government, what is causing these behavior, policy, and agenda shifts?

This thesis uses three analytical lenses to examine the causes of behavioral shifts since the 1979 Iranian revolution: 1979-1989, the Khomeini era; 1989-2004, the reformists; and 2004-present, the conservative hard-liners. Each lens investigates a different cause of the shifts; a) civil society, b) bureaucratic politics, and c) international politics. The goal of this thesis is to better understand what is driving Iran's politics and governance and why.

A thorough analysis using these three analytical lenses provides a three-dimensional perspective of the driving factor behind Iran's governmental politics. This analytic method can also be used to analyze the governmental politics of other countries and serve as a foundation for establishing effective foreign policy. Often, it seems foreign policy is formulated based upon a one-dimensional view. All three lenses together provide a more comprehensive approach to understanding how governments react to internal and external pressures. It is important to understand the causes of governmental behavior in order to develop more effective foreign policies and achieve strategic goals.

KEYWORDS: Iran, Khomeini, Rafsanjani, Khatami, Ahmadinejad, Revolution, Guardian Council

THE INTELLIGENCE REQUIREMENT OF PSYCHOLOGICAL OPERATIONS IN COUNTERTERRORISM

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Terrorism is not a new phenomenon to the world, yet it remains difficult to define and to counter. Countering terrorism requires several measures that must be taken at the same time. The counterterrorism strategies of most countries depend on military measures. However, those strategies should also focus on nonlethal measures, such as economic, political, and social measures. The psychological dimensions of

terrorism must be understood, evaluated, and used in countering terrorism. This study suggests that psychological operations, as nonlethal military operations, can be used to influence individuals to not join terrorist organizations and to facilitate defections from terrorist organizations.

However, in order to implement effective psychological operations, one has to have appropriate intelligence about terrorist organizations. Examining terrorist organizations helps to identify their vulnerabilities and obtain this intelligence. This thesis concludes that terrorists' motivations and terrorist organizations' radicalization, recruitment, and conversion processes, ideology, goals, strategies, and general structure form the intelligence requirement for psychological operations in counterterrorism. This study also examines the terrorist organization, al-Qaeda, to show its vulnerabilities.

KEYWORDS: Terrorism, Psychological Operations, Intelligence, Al-Qaeda

THE THEORY OF UNCONVENTIONAL WARFARE: WIN, LOSE, AND DRAW

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Clausewitz states that "the defensive form of warfare is intrinsically stronger than the offense" and to defeat "the stronger form of warfare" "an army's best weapon is superior numbers." Given these two facts, how do special operations forces defeat numerically superior forces fighting in the defense? William H. McRaven's book, *Spec Ops*, lays out a theory of special operations and six principles that are "applicable across the spectrum of special operations" (McRaven, 1995, p. 3). McRaven's thesis postulates that numerically inferior forces can obtain relative superiority for a short duration through the use of the six principles of special operations. McRaven's thesis focuses on the direct component of special operations. Arguably, the theory does not cover the full range of special operations; specifically, it fails to address the indirect component of special operations, unconventional warfare. Given that the defense is the superior form of warfare and numbers count, the question emerges: how can the counter-state defeat the state, which begins with an opening advantage of vastly superior numbers and already in the defense posture? The answer may be found on the flip-side of McRaven's Theory of Relative Superiority, or more accurately, the Indirect Theory of Relative Superiority. Indirect relative superiority is achieved when a counter state gains and maintains a decisive advantage over a state in an armed political struggle. It is hypothesized that numerically inferior forces can obtain relative superiority over time through the use of six principles of indirect offensive operations: security, networking, purpose, indoctrination, influence, and agility.

KEYWORDS: Unconventional Warfare, Relative Superiority, Indirect Warfare, Mujahedin, Afghanistan, Cuba, Che Guevara, Bolivia, Iran, Hezbollah, Lebanon

DATA INTEGRATION TO EXPLORE THE DYNAMICS OF CONFLICT: A PRELIMINARY STUDY

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This thesis is an exploration of the concepts of data integration with respect to military operations. It is an attempt to establish practices that analysts and operators can use to integrate many types of data from disparate sources. The project focuses on two software platforms: Palantir Technologies and Google Earth. These specific programs are utilized because they provide off-the-shelf products that are easy to use, require little training, and are compatible with each other. Using these software packages, an attempt is made to integrate data with geospatial, temporal, and relational data in order to gain greater understanding and insight into complex problems.

KEYWORDS: Data Integration, Data Layering, Fusion Center

THE STRATEGY-LEGITIMACY PARADIGM: GETTING IT RIGHT IN THE PHILIPPINES

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Political legitimacy is at the heart of any conflict or war. Based on the idea that wars cannot be won without establishing and maintaining political legitimacy, this thesis examines how the counterinsurgency (COIN) strategies developed in Basilan, Bohol, and Sulu address the legitimacy problem. The thesis also offers recommendations for developing a COIN strategy for Mindanao. The thesis uses Ted Gurr's Theory of Relative Deprivation as a framework to explain the factors that lead a society to revolt. It also underscores the importance of providing a long-term solution to the insurgent problems by correcting the underlying issues of poverty, deprivation, and lawlessness. In Basilan, Bohol, and Sulu, the Philippine government and its U.S. allies successfully engineered what Borer describes as the "strategy-legitimacy nexus." By promoting the legitimacy of the Philippine government, the insurgents' capabilities and influence were substantially reduced by isolating them from the population. Using the same framework, the three case studies demonstrate that while conditions in Mindanao are very different, the case studies offer valuable lessons. These are applied to conducting COIN in the region utilizing an indirect-approach strategy and are based on McCormick's Diamond Counterinsurgency Model, which promotes legitimacy through good governance and improved security and socio-economic conditions.

KEYWORDS: Legitimacy, Counterinsurgency, COIN, Insurgency, Insurgent, Relative Deprivation, Revolutionary Consciousness, Strategy-Legitimacy Nexus, Philippines, Mindanao, Basilan, Bohol, Sulu, Abu Sayyaf Group, ASG, Jamaah Islamiyah, JI, MILF, MNLF, Armed Forces of the Philippines, Joint Special Operations Task Force–Philippines, JSOTF-P, Special Forces, Balikatan, Civil-Military Operations, Information Operations, SALAAM, Bangsamoro, Gurr, Borer, McCormick

REORGANIZING SPECIAL OPERATIONS FORCES FOR IRREGULAR WARFARE

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The U.S. military has developed doctrine to respond to irregular warfare (IW) threats. According to this doctrine, IW favors indirect approaches. Within the U.S. Special Operations Command (USSOCOM), Army Special Forces, Civil Affairs, and Psychological Operations units were created to conduct special operations of an indirect nature. These units, specifically Army Special Forces, have been heavily engaged in major combat operations in Operation Iraqi Freedom and Operation Enduring Freedom, and they have been unable to break away in order to return to their assigned areas of responsibility. This thesis explores how a reorganization of USSOCOM in order to create an IW organization would fill capability gaps created by having 80% of USSOCOM's forces dedicated to Iraq and Afghanistan. This thesis identifies factors that need to be considered when creating an IW organization, such as regional orientation and interagency capabilities. This thesis also outlines two possibilities for an IW organization as a framework to create a starting point and an ending point along the spectrum of organizational possibilities. This thesis concludes with a recommended IW organization.

KEYWORDS: Irregular Warfare, Indirect Approach, Special Forces, Joint Irregular Warfare Command

TRANSFORMING ARMY GENERAL PURPOSE FORCES FOR SIMULTANEOUS, DISSIMILAR OPERATIONS

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Preparedness for operations in both the irregular warfare (IW) and major combat operations (MCO) environments is essential given a tumultuous and unpredictable contemporary operational environment. In an effort to provide a solution to the U.S. Army's emerging trend towards a uni-focused approach to operations centered on IW, this thesis proposes recommendations for change to the current Army force structure centered on the brigade combat team, and the Army Force Generation Model through which these units are channeled for refit, training, and deployment. These modifications are intended to optimize the Army for deterrence, independent operations in either the IW or MCO environment, or most importantly, simultaneous, dissimilar operations.

KEYWORDS: General Purpose Forces, GPF, Brigade Combat Team, BCT, Army Force Generation, ARFORGEN, Irregular Warfare, IW, Major Combat Operations, MCO, Transformation, Force Structure, Simultaneous Dissimilar Operations

"TO HELL WITH THE PAPERWORK:" DECIPHERING THE CULTURE OF THE AIR COMMANDOS

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This thesis adopts an organizational design framework proposed by Vijay Sathe in order to explore the culture of the historic Air Commandos. The organizational culture of the Air Commandos is important because it nurtures the attributes that help define today's Air Force special operations forces. Throughout this thesis, three overwhelming themes emerge regarding the basic assumptions and beliefs (the organizational culture) of the Air Commandos. Each of the themes provides insight into the internal integration of the Air Commandos and suggests how they negotiated their external environment. The shared beliefs and basic assumptions of the Air Commandos include: humans are the most critical resources in an organization; innovation, improvisation, and adaptation are more important than advanced technology; and successful mission accomplishment is more important than adherence to standard military conventions.

KEYWORDS: Air Commando, Organizational Culture, Air Force Special Operations Command, Carpetbaggers, Special Operations, Aderholt, Cochran, Alison

NATO MEMBERSHIP FOR BOSNIA AND HERZEGOVINA: OBSTACLES AND CHALLENGES

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In order to provide for its future security, Bosnia and Herzegovina aspires to NATO membership. It intends to be not only a consumer of security, but also a provider of security for its allies. Because of the history and specific regional context of its relations with its neighbors, Bosnia and Herzegovina faces many obstacles. Although Bosnia and Herzegovina is still engaged in a stabilization and reconstruction process, Sarajevo is trying to find the best possible way to achieve the goal of NATO membership. This thesis analyzes the main obstacles on the way to NATO membership, identifies ways to surmount them, and offers recommendations for future policy. It is hoped that this thesis will be beneficial to policymakers, who need to promote focused and united national efforts and generate synergy to help Bosnia and Herzegovina successfully achieve NATO membership, thereby securing a better future for the country itself and Europe as a whole.

KEYWORDS: NATO Membership, Security, Stabilization and Reconstruction Process, Defense Reform, Foreign Policy, Obstacles, National Efforts

PAKISTAN'S LAW-ENFORCEMENT AGENCIES – HARNESSING THEIR POTENTIAL TO COMBAT TERRORISM

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In the aftermath of 9/11, the United States of America embarked upon a massive global hunt for terrorists and launched "Operation Enduring Freedom" in Afghanistan. Owing to its geographical proximity to Afghanistan, Pakistan emerged as an ally of the U.S. in its war against terrorism. Terrorists, having been evicted from Kabul, found the border areas of Pakistan and Afghanistan an idyllic sanctuary to promote future terrorism. During this period, terrorists extended their activities to other parts of Pakistan. At various stages, Pakistan's law-enforcement agencies (LEAs), Federal and Provincial Police, Frontier Constabulary, Levies, Frontier Corps, and Rangers, were dovetailed into Pakistani Army operations against terrorists, but their ability to maintain security in their respective areas of responsibility has been questionable. They had neither conducted such operations anywhere in the past, nor were they sufficiently trained and equipped to produce a matching response to the terrorists' inventive and innovative techniques.

Notwithstanding the sacrifices of troops employed against terrorists in Pakistan, it is extremely important to objectively review the LEAs' demonstrated training skills and combat worthiness in the country's ongoing counterterrorism campaign. This research focuses on appraising the existing infrastructure of Pakistan's LEAs and their potential to combat the menace of terrorism. Since Pakistan is currently fighting terrorism with the Army in a lead role, this thesis emphasizes the importance of enhancing the capabilities of LEAs other than the military to forestall, prevent, and effectively counter terrorists. The thesis emphasizes that the LEAs of Pakistan are a linchpin in the maintenance of law and order in the country, and their restructuring, training, and funding ought to be a priority for the Pakistani government. Recommendations are provided for upgrading these LEAs, which could transform these law enforcing bodies into an invincible security mechanism against the looming threat of multifaceted terrorism in Pakistan.

KEYWORDS: LEAs, Pakistan, Terrorism, FATA, Response Parameters, Reorganization, Training Methodology, Outlook of the LEAs, Execution Plan

THE NEED TO IMPROVE POPULATION AND RESOURCE CONTROL IN THAILAND'S COUNTERINSURGENCY

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Since January 2004, southern Thailand has seen a return of the Malay Muslim separatist disagreement with the central government. In this new round of resistance, the insurgents' activities are well planned and well organized, have brought about heavy damage to property and life, and created much confusion, making investigation and counter-operations difficult. This thesis examines the root cause of the insurgency, errors in countering insurgency in the past, the insurgents' activities in this new round, and the performance of the Thai government in countering the problem. The argument posed in this thesis is that the existence of "daily deadly incidents" in 2007 indicated that after four years of government suppression, the insurgents still had the freedom to maneuver. The government has not been successful in providing civil security and protecting the population from the insurgents.

This thesis focuses on the role of the military in creating secure environment and control areas by conducting population and resource control. Areas for improvements and modifications are suggested. By improving population and resource control measures, the military will be able to reduce the insurgents' influence, establish civil security, and finally control areas.

KEYWORDS: Insurgency, Counterinsurgency, Civil Security, Secure Environment, Population and Resource Control, Separatist, Control Areas, Pattani, Thailand

POPULATION-CENTRIC INTELLIGENCE, REPRESSION, AND THE CYCLES OF CONTENTION

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In this thesis, the role of intelligence in the cycle of contention between the state and emergent, insurgent movements within the context of violent, contentious politics is examined. This thesis explores the implications of initial levels of intelligence vis-à-vis the scope, organization, modus operandi, and composition of nascent insurgent movements. Specifically, the thesis considers the role that particular types of intelligence play in allowing for effective repression targeting and timing to counter emerging insurgent threats. Furthermore, this research explores and expands upon the notion proposed by Mohammed Hafez that a reactive and indiscriminate repression policy, attendant on a paucity of initial intelligence, has the effect of causing a nascent insurgent movement to become: 1) increasingly violent, 2) less visible to the state as it resorts to informal networks for mobilization and operation, and 3) expanded in size as a greater number of individuals become alienated from the state and find common cause with the insurgent movement and its framing of the conflict. Finally, this research considers how adaptive states may learn from the dynamic interaction with insurgent movements by improving their intelligence paradigm so as to generate that intelligence which allows for increasingly proactive and discriminate repression.

KEYWORDS: Population-Centric Intelligence, Ethnographic Intelligence, Law Enforcement Intelligence, Insurgency, Repression Policy, Repression, Intelligence Policy, Counterinsurgency, Insurgency, Social Movement Theory, SMT, Social Movements, Contentious Politics, Northern Ireland, Vietnam, Phoenix Program, Phung Hoang, CORDS, ICEX, Irish Republican Army, IRA, Provisional IRA

THE ARMY CIVIL AFFAIRS OFFICER EDUCATIONAL PIPELINE: A SUPPLY AND DEMAND ANALYSIS

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This study analyzes the requirements of civil affairs (CA) officers to operate successfully in current and future U.S. military interventions. First, the study assesses the current and future threat situation, combined with the most recent United States policy and doctrine, to determine the skill set required of current and future CA officers. Second, this study critically evaluates the current Army CA officer educational pipeline, from commissioning through field grade officer, to determine the skills with which the military indoctrinates and trains CA officers. The study compares the required skill set to the existing curriculum, and additional skills not incorporated into the existing CA officer training are described and examined for relevancy. The study concludes with several different educational options that could potentially resolve the skill shortfalls.

KEYWORDS: Army, Irregular Warfare, Counterinsurgency, Stability Operations, Foreign Internal Defense, SSTR, Organizational, Stability Operations, Civil Affairs, National Security Strategy, National

Defense Strategy, Naval Postgraduate School, Advanced Civil Schooling, Professional Military Education, Department of Defense Directive 3000.05, NSPD-44

ADVANCING UNDER FIRE: WARTIME CHANGE AND THE U.S. MILITARY
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This study begins with the premise that no military is ever optimally configured for any conflict into which it enters. Therefore, the need for significant changes to doctrine, organization, and technology almost invariably arises. Significant changes do not come about easily in military organizations, especially during wartime. This study examines the underlying conditions necessary for making major changes during wartime. First, the relevant literature covering both military and organizational change is surveyed in order to build hypotheses about wartime change. Then, a framework and typology are developed with which to study change in the complex endeavor of a military at war. Finally, the United States military's experiences in World War II, Vietnam, and the Global War on Terror are used as case studies with which to test those hypotheses and derive conclusions about the conditions under which change can occur during wartime.

KEYWORDS: Military Change, World War II, Vietnam, Operation Enduring Freedom, Operation Iraqi Freedom, Doctrine, Organization, Technology, Warfare, Levels of Warfare, Strategic, Operational, Tactical

KEEPING CURRENT AND INCREASING THE EFFECTIVENESS OF THE DECISION-MAKING PROCESS AND INTEROPERABILITY IN THE DIGITAL AGE: GEOSPATIAL INTELLIGENCE AND GEOSPATIAL INFORMATION SYSTEMS' APPLICATIONS IN THE MILITARY AND INTELLIGENCE FIELDS FOR THE MEXICAN NAVY
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The birth of the digital era — full of new technologies and information systems that increase as time goes by — has forced the military to embrace these innovations so that they do not lose effectiveness or become obsolete when compared with other countries' armed forces. One of these innovations is the Geospatial Information System (GIS), which is the result of geography's evolution from its application for naming and delineating the boundaries of countries, seas, and rivers. Modern day applications of this science have transformed it into a more scientific, mathematical, and technological field – it has become a powerful tool for geospatial intelligence (GEOINT) analysts, and it supports the decision-making process in the intelligence and military fields.

This thesis introduces the GEOINT-process-model and the main GIS applications in the intelligence and military fields. A practical scenario that embraces a special operations forces operation is developed through use of the GEOINT process and ArcGIS software. Furthermore, this thesis presents a preliminary approach for the Mexican Navy to embrace the use of GIS and GEOINT.

KEYWORDS: Geospatial Intelligence, Geospatial Analysis, Spatial Analysis, Geospatial Information Systems, GEOINT, GIS, Imagery, Imagery Intelligence, IMINT, Mexican Navy, Mexico, ArcGIS, Risk Map, Suitability Map, Suitability Equation

RUSSIA: A NEW EMPIRE UNDER CONSTRUCTION–THE RUSSIAN POLICY TOWARDS FORMER COMMUNIST SATELLITES—MECHANISMS OF EXERTION OF INFLUENCE

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The bankruptcy of the communist ideology left Russia in an uncomfortable position at the top of a falling empire. This new, geopolitical reality demanded redefinition of Russian national interests and goals. Recovering from the shock of the lost Cold War took almost a decade in Russia; recovery symbolically ended when the old and ailing President Yeltsin was replaced by the young and active Putin. Under President Putin, Russian policy adopted some characteristics of radical nationalism, neo-imperialism, and Great Power sentiments. This thesis examines how the Russian foreign-policy strategy was developed and used as a tool for exertion of influence over the post-communist states, particularly Poland, Ukraine, and Georgia. The Balance of Power Model of International Relations serves as the theoretical framework for drawing conclusions from the research and formulating policy recommendations for the examined countries. Each case study is organized around the evaluation of four dimensions of state power, namely diplomacy, information, military, and economy. The approach adopted to assess these four fields assumes that there are both conventional and unconventional mechanisms used by Russia in each of these fields.

KEYWORDS: Russia, Balance of Power, Neo-Imperialism, Poland, Ukraine, Georgia, Deterrence, Oil and Gas

COUNTERING TERRORIST IDEOLOGIES: A RATIONAL ACTOR AND GAME THEORETIC ANALYSIS OF DE-RADICALIZATION PROGRAMS FOR AL-JEMAAH AL-ISLAMIYAH PRISONERS IN SINGAPORE AND INDONESIA

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Countering terrorist ideologies is a task that relies exclusively on trust in an authority and the matching of incentives to individual needs for any success to be realized. Broad messaging campaigns undertaken by both physically and/or culturally removed authorities have little impact due to credibility problems and tendencies to over-generalize. This thesis, proposing that successful counter-ideology occurs at the level of the individual, constitutes a rational actor and game theoretic analysis of counter-ideology programs in Indonesia and Singapore, evaluating their unique, individually targeted approaches to the problem of terrorist detainee de-radicalization. A survey of the Al-Jemaah Al-Islamiyah (JI) terrorist group's cultural elements provides specific vulnerabilities that can be used to counter the individual detainee's attraction to the JI ideology. While both programs rely upon the influence of an authority to de-radicalize prisoners, they achieve this goal through very different ways of targeting individual vulnerabilities, building trust, and administering incentives. In the end, establishing detainee trust in diverse authorities is shown to be plausible, as is using de-radicalized prisoners and the newly trusted authority to influence prisoners to give up at least portions of the ideology. The results are categorized with respect to design of future counter-ideology and de-radicalization programs.

KEYWORDS: Terrorism, Terrorist, Ideology, Radicalization, Disengagement, Jemaah Islamiyah, Rehabilitation, Counter-Terrorism, De-Radicalization, Counter-Ideology

TECHNOLOGICAL INNOVATION: ROLES AND IMPLICATIONS IN ARMY AVIATION SPECIAL OPERATIONS

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The Global War on Terror and the recent shift of focus from conventional warfare to unconventional warfare highlight the need to replace Cold War-era helicopters. Case studies, including the development of the AH-56 Cheyenne, OH-13 Sioux, and the MH-60 Direct Action Penetrator, provide reference points to develop a general premise of the aviation community's ability to capitalize on technological innovations. Examining the process of innovation throughout the history of Army aviation provides a framework to apply the concepts of innovation to current and future operations of Army Aviation Special Operations.

KEYWORDS: Innovation, Special Operations, Aviation, Rotary Wing, Helicopters, 160th Special Operations Aviation Regiment, SOAR

CONDUCTING THE SOFTER SIDE OF COUNTERINSURGENCY

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In a counterinsurgency (COIN), the local population becomes the center of gravity. Over the last three years, the U.S. military has rewritten many field manuals that focus on COIN, including a significant change to FM 3-0, *Operations*, and a complete revision of FM 3-24, *Counterinsurgency*. These changes in doctrine have forced the U.S. military's conventional force to reconsider its use of the kinetic force and begin to understand the use of more non-kinetic means, or the softer side of COIN, in order to reach sustainable peace. If non-kinetic actions are the way forward, how should units (battalion and below) be applying the softer side of COIN? This thesis considers, through context and assessment, the goals that are needed to achieve the right mix of kinetic and non-kinetic actions. Practitioners suggest that information operations, situational awareness, cultural awareness, and empathy are key components of effective counterinsurgency. This thesis argues further that network development and command influence have vital multiplier effects on these components. Without command influence, none are likely to take hold. Therefore, the thesis argues that command influence is the key aspect in achieving a balance between kinetic and non-kinetic actions in order to conduct effective COIN.

KEYWORDS: Counterinsurgency, COIN, Trust and Influence, Diamond Model, Equivalent Response Model, Non-Kinetic, Information Operations, Situational Awareness, Cultural Awareness, Empathy, Command Influence, Network Development, Balance of Force, Leadership Development

INFORMATION COMMUNICATION TECHNOLOGY, STATE BUILDING, AND GLOBALIZATION IN THE 21ST CENTURY: REGIONAL FRAMEWORKS FOR EMERGING STATE ASSISTANCE

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The U.S.-led effort to form transnational institutions and processes contributes to the decreasing relevance of the nation-state in relation to what has become known as globalization. Globalization has modified the essential role of the nation-state towards managing global flows of resource, capital, and populations, rather

than, as in the past, presiding over distinct national economies. The relationship between ICT and political stability is explored in order to determine the existence of a positive, negative, or non-existent correlation in the Asia Pacific region for 2007. The importance of distinct ICT policy design is examined via case studies of Myanmar and Malaysia. Considering these case studies, a regional approach to state building is outlined as offering a way beyond the current impasse in the theory and practice of state building. The regional framework for emerging state assistance that is proposed reinforces transnational process, makes substantive use of existing ICT, and builds upon ideas of locality to further security and development. The Hourglass Model, which is the schematic basis for the regional approach, could facilitate state building by balancing global processes with local security and development concerns. This approach enables the processes of capacity-development and consensus-building to take place at the transnational level, while reinforcing the shift of sovereignty upwards from the state to the regional framework and downwards to the local, sub-national level. The utility of ICT as an enabler for efficiency, transparency, and accountability makes clear the viability of such an approach.

KEYWORDS: Information Communication Technology, ICT, State-Building, Globalization, Political Stability, Regionalism, Myanmar, Malaysia

SPECIAL FORCES RECRUITING: THE OPERATIONAL NEED FOR TARGETED RECRUITMENT OF FIRST- AND SECOND-GENERATION AMERICANS

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The purpose of this thesis is to analyze the operational impact of recruiting first-generation Americans directly into special forces (SF). Much as the draft inadvertently did during World War II, the Army could take much greater advantage than it has of first-generation immigrants and naturalized citizens. SF could, in turn, target recruits from within this pool. A second aim of this thesis is to explain why this makes sense in the 21st century. This thesis reviews the use of non-citizens from WWII to the present, while also highlighting certain features of doctrinal SF missions. The aim is to draw on the past in order to preview the relevant usefulness of non-citizens today.

The arguments presented are conceptual in nature. They draw on the author's experiences as an SF recruiter and on extensive conversations with other recruiters currently serving in the Special Operations Recruiting Battalion. This thesis is not designed to criticize current recruitment methods. Instead, it explores ways to enhance what SF already does in order to target the kinds of candidates whom the author believes will prove crucial to 21st century operations.

KEYWORDS: Special Forces, Recruiting, First Generation Americans

SOFT POWER MEETS COUNTERINSURGENCY: AN ALTERNATIVE APPROACH TO DETERRING TERRORIST RECRUITMENT IN MINDANAO

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Terrorist activity in Southeast Asia remains a challenge to U.S. national security. In particular, terrorist organizations in the Philippines continue to conduct deadly attacks and attract more recruits despite U.S. and Philippine government counterinsurgency (COIN) efforts. In the seven years following the 9/11 terrorist attack, the Philippine and U.S. governments have combined efforts to address insurgency as a threat that hinders peace and security within the Philippines and also in Southeast Asia. Despite ongoing counterinsurgency operations in Mindanao, the southern region of the Philippines continues to exist as a hub for terrorist recruitment, training, and operations.

A key aspect in hindering insurgency growth within the Philippines is deterring terrorist recruitment by first identifying the underlying conditions that promote discontent among the people of Mindanao, making them susceptible to the ideology of militant Islam; and then implementing a strategy that includes a full range of activities, from kinetic to non-kinetic methods. It is clear that economic conditions, poor governance, and a lack of adequate social and educational programs are all contributing factors to the instability of Mindanao. What is not so clear is how to disrupt the cycle that sustains the terrorists, while gaining the affection of the Muslim minority who have been in opposition to the predominantly Christian government.

This thesis examines the counterinsurgency strategy by recognizing effective practices and identifying shortfalls in the approach. These findings suggest that by applying a mix of soft power, as defined by Professor Joseph Nye, as well as noöpolitik, as defined by Professors John Arquilla and Dave Ronfeldt, in relation to hard power practices, an alternative approach to counterinsurgency can offer the U.S. and Philippine governments a long-term, sustainable strategy that will diminish future radical Islamic threats and stabilize Mindanao.

KEYWORDS: Counter Insurgency, Soft Power, Noöpolitik

DISRUPTING ILLICIT SMALL-ARMS TRAFFICKING IN THE MIDDLE EAST

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The illicit trade in small arms and light weapons delivers a global supply of weapons and ammunition to the demand of rogue state and non-state actors. While arms do not create conflict, they increase the intensity of violent conflict. The illicit trafficking of small arms contributes to irregular conflicts in the Middle East, a region of persistent conflict and instability. The international community has attempted to regulate the global supply of small arms through non-binding agreement and embargoes, but these efforts have been ineffective in achieving the goal of preventing the flow of weapons to criminal organizations, terrorists, and other de-stabilizing, non-state actors. This thesis systematically examines the illicit small-arms trade to identify points of vulnerability. This study identifies a strategy to disrupt the flow of arms to specific groups or states by countering arms brokers and the networks of actors that brokers coordinate.

KEYWORDS: Small Arms Proliferation, Arms Trafficking, Arms Brokers, Middle East

MASTER OF SCIENCE
IN
ELECTRICAL ENGINEERING

TESTING AND EVALUATION OF A PEN INPUT DEVICE USING AN INERTIAL/MAGNETIC SENSOR MODULE

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In this thesis, the feasibility of developing a pen input device using an inertial/magnetic sensor module is investigated. The emphasis is on testing and evaluation of algorithms for computing handwriting trajectories based on accelerometer measurement data. This research starts by placing the inertial/magnetic sensor in a 2D plane and writing alphanumeric characters. Before continuing to evaluate the 3D writing, a calibration algorithm is implemented for computing the length between the nose of the pen input device and the point where the inertial/magnetic sensor is attached to the pen. A velocity correction algorithm is also applied by recognizing the pause phases in the writing in order to eliminate the drift in acceleration measurements and accurately reproduce handwriting trajectories. Extensive experiments conducted for 2D and 3D writings indicate that it is possible to develop a pen input device to track handwriting using an inertial/magnetic sensor module. However, the performance of the handwriting tracking depends on the accuracy of the sensor module and the speed of the writing motion.

KEYWORDS: Pen Input Device, Accelerometer, Handwriting, Quaternion

EFFICIENT IMPLEMENTATION OF FILTERING AND RESAMPLING OPERATIONS ON FIELD-PROGRAMMABLE GATE-ARRAYS FOR A SOFTWARE DEFINED RADIO

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In software defined radios, a good portion (or even the entirety) of the modulation and demodulation processes is performed in the digital domain. The data rate of the transmitted information is very important, because efficiency is a key requirement in real-time implementations and cost increases considerably with the number of samples-per-second to be processed. This thesis addresses the problem of efficient design of the resampling operations so that they can be implemented on field-programmable gate-arrays (FPGAs).

A set of filtering and resampling operations is developed in the Simulink environment through Xilinx/Simulink blocksets, where all the included subsystems of the design are fully accessible by the designer in any stage of operation. The key ingredient is the use of a Multiplier and Accumulator architecture, which can be either time-multiplexed for maximum hardware efficiency or run on a parallel structure for maximum time efficiency.

KEYWORDS: Digital Signal Processing, Software Defined Radio, Field Programmable Gate Array, Resampling, Filtering, Xilinx, System Generator

A PERFORMANCE ANALYSIS OF ALTERNATIVE JTIDS/LINK-16 COMPATIBLE WAVEFORMS WITH COMPLEX 64-BIORTHOGONAL-KEYED MODULATION

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The Joint Tactical Information Distribution System (JTIDS)/Link-16 is a hybrid, frequency-hopped, direct sequence, spread-spectrum system that is used for the exchange of real-time tactical data. The five-bit data symbols are encoded with a (31,15) Reed-Solomon (RS) code and transmitted over the channel with cyclical, code-shift keying modulation. Although JTIDS/Link-16 has proven to be operationally useful, one of its primary drawbacks is its limited data rate. This thesis focuses on performance analyses of alternative waveforms that achieve better data rates and better performance in terms of required signal power. Two alternative waveforms are considered in this thesis. The first alternative JTIDS/Link-16 waveform uses (31,15) RS encoding, just as with the original JTIDS/Link-16 waveform, but the five-bit symbol stream generated at the output of the RS encoder undergoes serial-to-parallel conversion to two five-bit symbol streams. Each five-bit symbol stream is then mapped into a six-bit symbol stream before being independently transmitted on the in-phase (I) and quadrature (Q) components of the carrier using complex 64-ary bi-orthogonal keying modulation (64-BOK). The second alternative JTIDS/Link-16 waveform uses (63,47) RS encoding, where the six-bit symbol stream generated at the output of the RS encoder undergoes serial-to-parallel conversion to six-bit symbol streams, which are then each independently transmitted on the I and Q components of the carrier using complex 64-BOK modulation. The performance results obtained for the two alternative JTIDS/Link-16 waveforms are compared to those obtained for the existing JTIDS/Link-16 waveform for additive white Gaussian noise (AWGN), as well as when both AWGN and pulse-noise interference (PNI) are present. Errors-and-erasures decoding (EED) and errors-only decoding are also considered for the two alternative waveforms. From the analyses, it is seen that the two proposed alternative JTIDS/Link-16 waveforms perform better in the presence of AWGN, as well as both AWGN and PNI. There is no significant advantage when EED is used for either of the two alternative waveforms considered. When perfect-side information demodulation is used, the results show significant improvements in performance for the two alternative waveforms when both AWGN and PNI are present.

KEYWORDS: JTIDS, Link-16, M-ary Bi-Orthogonal Keying, Reed-Solomon Coding, Pulse-Noise Interference, Additive White Gaussian Noise, Error-and-Erasure Decoding, Perfect-Side Information

DETECTION OF FREQUENCY-HOPPED SIGNALS EXPOSED TO NON-STATIONARY INTERFERENCE

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Frequency-hopped spread-spectrum signals are widely used in military communications to help combat or suppress interference due to jamming, other users of the channel, and multipath propagation. Frequency-hopped signals may be difficult to detect when embedded in background noise. Previous research has demonstrated techniques for interference reduction and filtering frequency-hopped spread-spectrum waveforms with minimum distortion when the frequency-hop rate is on the order of 1,000 hops per second and the waveform is embedded in stationary interference waveforms. The objective of this thesis is to apply previously developed interference reduction techniques to frequency-hopped signals that hop at a much lower rate in order to determine the efficacy and practicality of these techniques for hop rates as low as five frequency-hops per second when the signal-of-interest is embedded in non-stationary interference. The

technique used in this thesis to detect the frequency-hopped signals-of-interest is based on exponential averaging in the frequency domain. This method averages a weighted data-stream in real time. Specific fast Fourier transform block sizes and exponential average weights produce good results if the signal-to-interference and the signal-to-noise ratios are not too small.

KEYWORDS: Detection of Frequency-Hopped Signals, Exponential Averaging

PULSE-MODE LIGHT SENSING USING FOUR-LAYER SEMICONDUCTOR STRUCTURES AND THEIR APPLICATION IN ARTIFICIAL NEURAL NETWORKS

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Existing semiconductor photodetectors produce a steady current or voltage output in response to incident light that depends on the intensity of the light beam. In contrast, biological vision systems produce a stream of pulses with pulse rate representing the amount of incident light power. The goal of this thesis is to explore the use of a four-layer PNPN semiconductor structure as an optical detector that produces pulses instead of steady current or voltage output. The first task of this thesis is to show that the pulse interval distribution is dependent on the intensity of the incident light beam, and that the distribution of pulse intervals is described by a renewal process statistical model. The second task of this thesis is to use the unique characteristics of the pulse generating circuit, along with a neural network, to construct a 2D sensor array capable of recognizing visual patterns and thus modeling, to some extent, the human visual cortex.

KEYWORDS: Thyristor, SCR, Pulse Mode Operation, Poisson Process, Renewal Process, Neural Networks, Back Propagation, Pattern Recognition

OPTIMAL DATA TRANSMISSION ON MULTIPLE-INPUT MULTIPLE-OUTPUT OFDM CHANNELS

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This thesis investigates the physical layer performance of single-input single-output (SISO) wireless communications systems, as well as multi-antenna techniques, such as multiple-input single-output (MISO) and multiple-input multiple-output (MIMO) systems, the last two utilizing the Alamouti-based, space-time block-coding technique. All cases are based on the IEEE 802.16-2004 standard with OFDM using different values of coding rates. International Telecommunications Union channel models are selected for the wireless channel in the simulation process. The particular setting of interest is the case where partial channel state information is fed back to the transmitter for optimal control on the transmission rate. The performance results of the simulated SISO, MISO, and MIMO systems are compared among themselves.

KEYWORDS: SISO, MISO, MIMO, STBC, OFDM, IEEE 802.16-2004, ITU Channel Models, CSI

REDUCED PRECISION REDUNDANCY APPLIED TO ARITHMETIC OPERATIONS IN FIELD-PROGRAMMABLE GATE-ARRAYS FOR SATELLITE CONTROL AND SENSOR SYSTEMS

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This thesis examines two problems in on-board computing for space vehicles and develops rules for applying reduced precision redundancy (RPR) as a new method of fault tolerance in field-programmable gate-arrays against single event effects due to radiation on orbit. RPR was discovered by Snodgrass in 2006 and was first demonstrated using the single-input CORDIC algorithm. This research applies RPR to elementary multiple-input arithmetic operations (addition, subtraction, multiplication, division) and extends applications to multi-level combinations of these operations as they appear in spacecraft subsystems, specifically, communication and attitude determination and control. Further modeling and simulation work explores the impact of varying levels of reduction in precision on the performance of communication and control systems using RPR. Finally, a higher-fidelity dynamics model and control system are developed for the Naval Postgraduate School Bifocal Relay Mirror Spacecraft simulator, and potential application points for selective redundancy using RPR are identified.

KEYWORDS: Reduced Precision Redundancy, Fault Tolerance, SEU, SEE, FPGA, On-Board Processing, Radiation Effects, Software Defined Radio, FFT, Butterfly Operator, ADCS, Flexible Structure, LQG Control, BRMS, Reprogrammable Computers

A PERFORMANCE ANALYSIS OF AN ALTERNATIVE LINK-16/JTIDS WAVEFORM TRANSMITTED OVER A CHANNEL WITH PULSE-NOISE INTERFERENCE

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The Joint Tactical Information Distribution System (JTIDS) is a hybrid, frequency-hopped, direct sequence, spread-spectrum system that utilizes a (31, 15) Reed-Solomon (RS) code and cyclical, code-shift keying modulation for the data packets, where each encoded symbol consists of five bits. The primary drawback to JTIDS is the limited data rate. In this thesis, an alternative waveform consistent with the existing JTIDS waveform but with twice the data rate is analyzed. The system considered also uses (31,15) RS encoding, but each pair of five-bit symbols at the output of the RS encoder undergoes serial-to-parallel conversion to two five-bit symbols, which are then independently transmitted on the in-phase and quadrature component of the carrier using 32-ary orthogonal signals with a diversity of two. In this thesis, only coherent detection is considered. The performance obtained with the alternative JTIDS waveform is compared with the existing JTIDS waveform when only additive white Gaussian noise (AWGN) is present, as well as when pulse-noise interference (PNI) is also present. Errors-and-erasures decoding (EED), errors only decoding, and perfect side information (PSI) are also considered.

Based on the analyses, it is concluded that the alternative JTIDS waveform performs better in AWGN as well as when PNI is present for typical values of information bit error probability (i.e., Pb = 10-5 to 10-7). In AWGN, at Pb = 10-5, the alternative JTIDS waveform has a 2.3 dB gain in information bit energy over white noise ratio (EC / NO) as compared to the original JTIDS waveform. In AWGN and PNI, when EC / NO = 5 dB and Pb = 10-5 for both waveforms, the alternative JTIDS waveform is superior to the original JTIDS waveform with a gain in information bit energy over pulse-noise ratio (EC / NI) of 5.6 dB and 5.4 dB for $\rho = 0.2$ and 0.1, respectively, where ρ is the fraction of time the PNI is present. The use of

EED does not improve the performance of the alternative JTIDS waveform in AWGN and PNI as compared to errors-only decoding. With PSI, the alternative JTIDS waveform performs significantly better than the original JTIDS waveform with EED. At Pb = 10-6 and for $\rho = 1$, the alternative JTIDS waveform shows an improvement of 5.4 dB in EC / NI over the original JTIDS waveform and the gain improves for $\rho < 1$.

KEYWORDS: Link-16/JTIDS, (31, 15) Reed-Solomon Coding, RS Coding, 32-ary Orthogonal Signaling, Additive White Gaussian Noise, AWGN, Pulse-Noise Interference, PNI, Errors-and-Erasures Decoding, EED

MASTER OF SCIENCE
IN
ELECTRONIC WARFARE SYSTEMS ENGINEERING

AN ANALYSIS OF JORDAN'S PROPOSED EMERGENCY-COMMUNICATION INTEROPERABILITY PLAN FOR DISASTER RESPONSE

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Recently, the world has been affected by man-made and natural disasters on a level not seen before; these events highlight the importance of communication for an efficient and rapid response by first responder community (FRC) members in the field.

The resilience of a communication infrastructure is vital for the well-being of any country. It is essential to build a robust and interoperable information and communication technology (ICT) infrastructure before a disaster, which will facilitate patching/restoration/reconstruction when and after disaster hits.

In this thesis, overviews for most ICT standards currently available are introduced. This background is needed for any emergency-communication interoperability plan.

Training is very important in ensuring that staffs are ready to implement emergency plans when needed. In the context of power, range, and interoperability, exercises such as Strong Angel III (SAIII) are always the best approach for exploring different ICT systems, and the resilience of those systems, in case of disaster.

The Hashemite Kingdom of Jordan (Jordan) may benefit from studying the U.S.' experience in emergency communications, and may consider modifying its communications interoperability plans and improving its infrastructure to enhance readiness for disasters. The author explores Jordan's current emergency-communications interoperability plans, policies, and emergency operation plans, and compares Jordan's humanitarian assistance/disaster relief communications-readiness level with that of the U.S.

Based on the technological aspects of emergency communications, Jordan's communications environment, the requirements analysis of an emergency communications plan, and lessons learned from the U.S. experience, a proposed Jordan Emergency-Communications Interoperability Plan is introduced.

KEYWORDS: Hastily Formed Networks, HFN, Stability & Reconstruction, S&R, Humanitarian Assistance/Disaster Relief, HA/DR, Jordan's Emergency Communications Interoperability Plan, JECIP, Emergency Operation Plans, EOPs, First Responders Community, FRC, Information and Communications Technology, ICT

EXTRACTING HIDDEN TRAILS AND ROADS UNDER CANOPY USING LIDAR

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The field of remote sensing has been greatly benefited by the development of LIDAR. The extraction of bare earth under tree canopies and especially the identification of hidden trails are important tools for military and civilian operations in dense forests. LIDAR data from Sequoia National Park in California (2008) and Fort Belvoir Military Base in Virginia (2007) were two areas that were selected for analysis. Quick Terrain Modeler software was used in order to recognize hidden trails. The entire procedure was followed by ground truth verifications in Sequoia National Park and all the necessary preparations for the analysis of Fort Belvoir data were studied. The ground truth results in Sequoia were promising and the analysis of Fort Belvoir data was encouraging for further development of the system. Trails with a width less than 2 m were easily recognized in Fort Belvoir during the analysis of the data, which affirmed the high accuracy of the sensor. In the Sequoia area, only paved trails with a width less than 1.5 m were identified.

KEYWORDS: Lidar, Ladar, Laser Radar, Foliage Penetration, FOPEN, Poke-Through, Terrain Analysis, Trails, Sequoia National Park, Fort Belvoir Virginia, Hidden Trails, Quick Terrain Modeler, Lidar Accuracy, Lidar Error

MASTER OF SCIENCE
IN
ENGINEERING ACOUSTICS

MODELING THE PERFORMANCE OF MICRO-ELECTRO-MECHANICAL SYSTEM (MEMS)-BASED DIRECTIONAL MICROPHONES

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A micro-electro-mechanical system (MEMS)-based directional microphone consisting of two plates hinged at the center is modeled using finite element software. A new method is developed in which the sensor is acoustically coupled to an incoming sound wave. The method successfully reproduces results of previous, non-acoustic, coupled simulations for solid plates. The resonance frequencies match within 0.8% for the rocking mode and 2% for the bending mode. The displacement amplitudes match within 17% for the rocking mode and 5% for the bending mode.

After ensuring agreement with previous simulations, the model is extended to include more realistic boundary conditions. The sound pressure at the back of the plates is included, along with the drag force on the plates due to the acoustic particle velocity flow. This new model reproduces the experimentally achieved resonance frequency values within 21% for the rocking mode and 2% for the bending mode. The displacement amplitude obtained for the rocking mode is approximately six times lower than the experimental value, while the bending mode amplitude is 47% higher. Manufacturing tolerances for these MEMS devices likely contribute to the discrepancy between simulated and experimental values.

A novel design is proposed for increasing the displacement amplitude for both solid and perforated plates through the use of a Helmholtz resonator.

KEYWORDS: Simulation, Directional, Microphone, Acoustics, COMSOL

A DISCOVERY PROCESS FOR INITIALIZING AD HOC SEAWEB ACOUSTIC NETWORKS

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Seaweb is an underwater, acoustic, wide-area network connecting autonomous, distributed nodes. Prior iterations of Seaweb relied on operator intervention to initialize and manually configure the network routes. This thesis implements a network discovery process that enables a field of spontaneously deployed, ad hoc nodes to auto-configure for networking purposes. Network routing is initialized as nodes in the network are discovered, with routes chosen according to a comparative evaluation of a cost function for all candidate routes. The network discovery process implemented is tested using computer simulation and sea trial data. The resultant network routes obtained upon completion of the ad hoc network discovery process are compared with those derived from Dijkstra's algorithm. It is concluded that the network discovery process always produces a shortest-path route from a master node to any other discovered nodes in the network. Sensitivity studies on the route cost-evaluation function are performed, and an alternative network discovery scheme is discussed.

KEYWORDS: Underwater Networks, Acoustic Networks, Ad Hoc Networks, Network Discovery, Seaweb, Acoustic Communications, Acomms, Telesonar

MASTER OF SCIENCE
IN
ENGINEERING SCIENCE

HIGH-BANDWIDTH COMMUNICATIONS LINKS BETWEEN HETEROGENEOUS, AUTONOMOUS VEHICLES USING SENSOR NETWORK MODELING AND EXTREMUM CONTROL APPROACHES

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In future network-centric warfare environments, teams of autonomous vehicles will be deployed in a cooperative manner to conduct wide-area intelligence, surveillance, and reconnaissance (ISR) missions in a tactical environment. The operational range of these survey vehicles is usually limited by the line-of-sight (LOS) and/or bandwidth constraints of the communication system. To increase the operational range and to allow real-time transmission of data back to the command station, autonomous vehicles configured with a high-bandwidth communication system are positioned between the command station and the survey vehicles acting as communication relay vehicles and flying sensors. This allows the survey vehicles to transfer their data back to the command station on the move, thus improving the efficiency of the missions.

In this thesis, an autopilot guidance and control algorithm is developed that will allow the relay vehicles to reposition themselves autonomously to maintain an optimal loitering flight-path to maximize the quality of the communication link between the command station and the survey vehicle. The main contributions of this thesis are two-fold. First, a communication propagation model is developed to predict the signal-to-noise (SNR) ratio of the communication link, which is used as a reference SNR signal for the unmanned aerial vehicles. Second, the communication model is then integrated into a feedback control loop to formulate a new real-time adaptive controller, which is based on an extremum seeking approach with a gradient-based controller, to drive the relay vehicle to an optimal loitering path using SNR as the cost function.

KEYWORDS: Unmanned Aerial Vehicle, UAV, Extremum Seeking, Simulink, High Bandwidth Communication Links, SNR Model

MASTER OF SCIENCE
IN
HUMAN SYSTEMS INTEGRATION

AUTOMATED INTELLIGENT AGENTS: ARE THEY TRUSTED MEMBERS OF MILITARY TEAMS?

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Technological advances and increased operational challenges have led to the introduction of automated agents into military teams. Although these new combined teams have many advantages, it is possible that the interactions between members of these new human-automation teams may adversely impact mission accomplishment. This study investigates the similarities and differences between human–human teams and human–automation teams with respect to team communications, efficacy, and trust. Thirty-six participants are formed into twelve three-person teams. A confederate serves as the fourth member for all twelve teams. In the human–human team condition, the confederate is present in the same room as the other three team members. In the human–automation team condition, the confederate is located in a separate room and the other three team members are told that their fourth team member is an automated intelligent agent. All teams play a computer-based team firefighting game (C3Fire). The order of presentation of the two trials (human–human vs. human–automation) is counterbalanced. The results of this study indicate that there is a significant difference in the nature of the communication between these two types of teams. Additionally, the presence of an automated agent changes the nature of trust and team efficacy. These findings demonstrate the need to consider the unintended impact of including automated agents on team dynamics in military environments and other complex and dynamic systems.

KEYWORDS: Automation, Intelligent Agent, Team Performance, Communication, Efficacy, Trust, C3Fire

TACTICAL DECISION-MAKING UNDER CATEGORICAL UNCERTAINTY WITH APPLICATIONS TO MODELING AND SIMULATION

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The network-centric warfare approach to command and control emphasizes decentralized decision-making. Consequently, decision-makers must comprehend and evaluate information to determine the optimal course of action. This study examines how different categories of uncertainty (ambiguous/missing, conflicting, baseline) and individual differences affect response-time in decision-making tasks. Real-world tactical scenarios in which uncertainty was present are elicited from veterans of Operation Enduring Freedom and Operation Iraqi Freedom. Nine scenarios are given to 28 participants at the Command General Staff College, Ft. Leavenworth, Kansas. The participants are asked to make a decision; their responses are recorded and analyzed. The results indicate that the category of uncertainty and scenario difficulty are significant factors in determining response time. No individual difference factors are found to be significant. These findings have the potential to improve human behavior modeling, tactical simulations, and representations of complex task environments.

KEYWORDS: Uncertainty, Ambiguity, Decision-Making, Tactical Decision-Making, Network Centric Warfare, URS, NEO-FFI

HUMAN SYSTEMS INTEGRATION IN THE U.S. NAVY FRIGATE COMMUNITY: OPERATIONAL READINESS AND SAFETY AS A FUNCTION OF MANNING LEVELS

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Human systems integration (HSI) is a process designed to reduce life-cycle costs and improve system performance by considering human-related domains. Acquisition specialists lack objective, quantitative research findings on which to base trade-off analyses. This thesis uses eight fiscal years of historical safety (mishaps), manpower (manning levels), and system performance (SORTS) data (collected from computer databases of routine reports) on the U.S. Navy's frigates to explore relationships in an existing, notional model of HSI. Three hypotheses are tested; there is a negative relationship between manning and SORTS levels, there is a negative relationship between manning and mishaps, and there is a positive relationship between mishaps and SORTS levels. No significant relationships are found between SORTS levels and manning or mishaps. When all of the ships are ranked for each month based on percent of total manning and number of reportable mishaps, a positive correlation (Spearman's rho = 0.4194, p-value = 0.0294) is found corresponding to a negative relationship between manning levels and mishap rates. More detailed research is needed to isolate the relationship between manning levels and mishap rates from numerous other influences and any noise that may be present in the data set.

KEYWORDS: Human Systems Integration, Safety, Mishaps, Manning, Frigates, SORTS, EDVR

MARINE AVIATION WEAPONS AND TACTICS SQUADRON ONE (MAWTS-1): SLEEP, FATIGUE, AND AVIATOR PERFORMANCE STUDY

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The Weapons and Tactics Instructor (WTI) course conducted at the Marine Aviation Weapons and Tactics Squadron One (MAWTS-1) command in Yuma, Arizona, is considered the capstone of Marine aviation training. Concerned about its high aviation incident rate, MAWTS-1 leadership asked the Naval Postgraduate School to assess whether student sleep is a contributing factor.

In a baseline study at MAWTS-1, the students were found to be chronically sleep deprived. Six months later, this thesis effort gathered sleep data on 20 WTI 1-06 student pilots using wrist activity monitors and activity logs. Results show the mean nightly sleep to be significantly higher than the baseline study, possibly caused by the implementation of a Tactical Risk Management course. Unlike their predecessors, the students in WTI 1-06 were not sleep deprived. As a result, no significant correlations are seen between sleep quantity and quality and student performance, as measured by exam and flight scores, or between predicted effectiveness and performance, as generated with the Fatigue Avoidance Scheduling Tool (FAST) program. While other variables are found to be slightly correlated with performance, several issues are identified that may have affected these results. Recommendations for improving future studies are provided.

KEYWORDS: Cumulative Sleep Loss, Fatigue, Pilot, Marine Aviation Weapons and Tactics Squadron One, Weapons and Tactical Instructor, Fatigue Countermeasures, Predicted Performance

THE COSTS AND BENEFITS OF INCREASING THE MINIMUM SERVICE REQUIREMENT FOR NROTC GRADUATES

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On 9 June 2008, during the Future Years Defense Program Officer Accessions Brief, the Chief of Naval Personnel requested more information on increasing the NROTC minimum service requirement (MSR) for newly commissioned officers from four years to five years. The present study uses a distributed survey to assess the potential impact of increasing the minimum service obligation on NROTC program recruitment. The survey responses as a whole suggest that increasing the MSR from four to five years will have no impact on the propensity for college students to apply for scholarships in the NROTC program. In terms of specific demographic groups, the survey results suggest that the impact on female applications would be minimal, and the impact on minorities would be small but statistically significant.

KEYWORDS: Midshipmen, Minimum Service Requirement, Minority, Survey, SurveyMonkey

MASTER OF SCIENCE
IN
INFORMATION OPERATIONS

POPULATION PRESSURE AND THE FUTURE OF SAUDI STATE STABILITY
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Political stability in Saudi Arabia is a key strategic concern of the United States and the international community. As the largest producer of oil in the world and the country with the greatest proven reserves of oil, Saudi Arabia will be a central player in the world's economic health for decades to come. However, Saudi Arabia is also characterized by one of the fastest growing population rates in the world, and its economic and political capacity to absorb such rapid population growth is not so clear. There is a growing body of literature that systematically links demographic growth and political instability, including revolutionary instability. This thesis draws on Goldstone's Model to predict whether Saudi Arabia may be vulnerable to severe instability based on rapid demographic change. The Political Stress Indicator Model consists of three conditions that must exist simultaneously for large-scale, internal crises to occur; namely, fiscal crisis, elite dissent, and social mobilization. The major finding is that the Saudi regime will likely be able to maintain political stability in the foreseeable future. While it is concluded that Saudi Arabia will not face revolutionary instability in the foreseeable future, these problems are serious enough that close monitoring of the situation is warranted.

KEYWORDS: State Stability, Saudi Arabia, Jack Goldstone, Revolution Theory, Elite Groups, Al-Saud Family, Ulama, Shi'a Leaders, Islamo-Liberal Reformists, Rentier State, Elite Mobilization, Tribalism, Population Growth, Urbanization, Youth Bulge, Information Control, Information Strategy

IRAN: THE POST-REVOLUTIONARY EVOLUTION
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Following the 1979 Iranian revolution, Ayatollah Khomeini and his followers established a complicated and paradoxical government that combined an authoritative, theocratic government with democratic underpinnings. Although the structure of the government has remained relatively unchanged for almost three decades, the government's bureaucracy and policies have experienced an ongoing evolutionary process that has given rise to three distinct shifts, with radicals, reformists, and conservative hard-liners taking turns steering the country and pressing different agendas. These three shifts present an interesting puzzle: given the strict authoritative nature of Iran's theocratic government, what is causing these behavior, policy, and agenda shifts?

This thesis uses three analytical lenses to examine the causes of behavioral shifts since the 1979 Iranian revolution: 1979-1989, the Khomeini era; 1989-2004, the reformists; and 2004-present, the conservative hard-liners. Each lens investigates a different cause of the shifts; a) civil society, b) bureaucratic politics, and c) international politics. The goal of this thesis is to better understand what is driving Iran's politics and governance and why.

A thorough analysis using these three analytical lenses provides a three-dimensional perspective of the driving factor behind Iran's governmental politics. This analytic method can also be used to analyze the governmental politics of other countries and serve as a foundation for establishing effective foreign policy. Often, it seems foreign policy is formulated based upon a one-dimensional view. All three lenses together provide a more comprehensive approach to understanding how governments react to internal and external pressures. It is important to understand the causes of governmental behavior in order to develop more effective foreign policies and achieve strategic goals.

KEYWORDS: Iran, Khomeini, Rafsanjani, Khatami, Ahmadinejad, Revolution, Guardian Council

PROSPECTS FOR CYBERSPACE DETERRENCE
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In today's information age, a nation's dependence on cyberspace is becoming an increasingly important aspect of national security. As technology has improved, and more sectors of critical national infrastructure are interconnected in cyberspace, the level of risk to national security has increased dramatically. Neither security policies nor international laws have been able to keep up with the demands of the rapidly evolving cybersphere. Nations need to examine ways to influence their adversaries against attacking critical infrastructure via cyberspace. Deterrence concepts and policies need to evolve to a level that can be applied to various actors, from the state to the non-state level. The cost of entry to employ cyberspace capabilities is extremely low compared to what it takes to establish conventional or nuclear forces. If the Estonia and Georgia cyber attacks of 2007 and 2008 have taught us anything, it is that highly networked nations can be vulnerable to cyber attacks. If a significant investment is made in successful deterrence strategies, the outlook for adopting a fully networked society may not seem so threatening.

KEYWORDS: Cyberspace Deterrence, National Security, Critical Infrastructure, Tailored Deterrence, Computer Network Attacks, Computer Network Defense

INTEGRATION OF INFORMATION OPERATIONS
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The purpose of this thesis is to examine whether the U.S. military is fully integrating information operations (IO) in combat operations. Using the theories of Henry Mintzberg and Richard Daft as the organizational frame of reference, and Claude Shannon, John Diebold, and Martin Libicki's information theories as the second frame of reference, this thesis produces testable hypotheses to analyze four case studies to determine which frame of reference has a greater impact on the integration of IO into combat operations. As a brigade S-7 (IO) during twelve months of Operation Iraqi Freedom, the author saw firsthand how an effective, integrated, IO campaign plan works – from the individual soldier to the operational level. Concurrently, the author saw a lack of guidance and a disconnect from the senior leadership regarding the overall strategic plan for information operations. The absence of policy and guidance on IO in the Global War on Terror and the absence of clear, outlined goals in developing and waging an IO strategy have undermined the ability of IO practitioners to conduct effective IO campaigns.

KEYWORDS: Information Operations, Information Superiority, Organizational Design, Information Theory, Integration

MAKING DEMOCRACY SAFE FOR THE WORLD: A GAME THEORY ANALYSIS OF THE IMPACT OF ELITES ON THE DEMOCRATIZATION PROCESS

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In this thesis, two approaches to democratization are explored: top-down and bottom-up. A top-down approach begins by building civic identity through the establishment of liberal institutions that foster democratic ideals at the national level and propagate down to the individual. A bottom-up approach begins by developing social capital within individuals, continues by forming civic and political associations, and culminates in a national, democratic identity. Each avenue exhibits unique strengths and weaknesses, and its effectiveness in installing a successful democracy is measured using a list of eight criteria. In democratization, national elites represent the most significant variable due to their power and influence. Based on psychological profiling, elites fall into two categories: self-oriented and servant-oriented. Resulting from game theory analysis, transitioners favor the top-down approach, servant-oriented elites favor accepting democracy, and self-oriented elites favor rejecting democracy. This analysis predicts that democratization will succeed whenever transitioners encounter sufficient servant-oriented elites (35%) to induce support from national elites. Where servant-oriented elites are inadequate, transitioners must boost their influence, or offer incentives to obtain elite support. Otherwise, attempts at democratization will likely fail.

KEYWORDS: Democracy, Democratization Process, National Elites, Partial Conflict, Game Theory

LATERAL COORDINATION OF INTERDEPENDENT U.S. ARMY INFORMATION TASKS

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The purpose of this thesis is to determine whether the U.S. Army is adequately prepared or organizationally structured at the operational and tactical levels of warfare and command to execute synchronous information operations in light of recent doctrinal changes. Implementation of the new *Army Field Manual (FM) 3-0, Operations*, will significantly affect the conduct of information and influence operations in the U.S. Army at the operational and tactical levels of warfare and command. *Field Manual 3-0*, published 27 February 2008, revised how the Army views information operations and the staff responsibility for the tasks associated with them. U.S. Army information operations is now doctrinally divided into five Army information tasks, with the responsibility redistributed to different staff functional cells, ultimately to be synchronized by the operations process. The five Army information-functional cells possess a reciprocal interdependence with each other, each providing inputs and feedback to the others. This study concludes that a lateral coordination process should be applied to the functional structure of the staff organization to accomplish information tasks. A direct liaison or full-time integrator role should be applied to the organization to integrate IO elements' capabilities and related activities and synchronize information activities. The combined performance and effectiveness of the staff organization requires a lateral process of coordination to synchronize the highly interdependent information tasks.

KEYWORDS: Information Operations, Information Superiority, Organizational Design, Task Interdependence, Lateral Coordination Processes

MASTER OF SCIENCE
IN
INFORMATION SYSTEMS AND OPERATIONS

AN ANALYSIS OF COLLABORATIVE-TECHNOLOGY ADVANCEMENTS ACHIEVED THROUGH THE CENTER FOR NETWORK INNOVATION AND EXPERIMENTATION

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The primary focus of this thesis is to analyze collaborative-technology advancements experienced through the experimental cycles in which members of the Naval Postgraduate School (NPS) Center for Network Innovation and Experimentation (CENETIX) participate. These experiments, which include maritime interdiction operations and tactical network topology scenarios, have advanced a great deal since their inception, and there is a need for a detailed study into which changes have produced the greatest benefits to NPS and its partners.

KEYWORDS: Collaboration, Tactical Network Topology, Center for Network Innovation and Experimentation, CENETIX, TNT, Command and Control, MIO

MASTER OF SCIENCE
IN
INFORMATION WARFARE SYSTEMS ENGINEERING

EXPLORING THE STRUCTURE AND TASK DYNAMICS OF TERRORIST ORGANIZATIONS USING AGENT-BASED MODELING

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This thesis examines the structure and attributes of the terrorist network that was responsible for the 2004 Madrid bombing. A Baseline Computational Model is produced using POW-ER, based on data from academic papers and news articles about the 2004 Madrid bombings. The Baseline Model is further compared with two different representations of the same terrorist group: 1) the Expert Model, which is identical to the Baseline Model except for the fact that the actors have high application experience and skill levels, and 2) the Hierarchical Model, which is similar to the Baseline, but with a hierarchical structure. All models are tested under both baseline and high-counterterrorist conditions. This thesis examines how different contingency factors affect the preparation and execution of a terrorist bombing attack. Recommendations to inform counterterrorist agencies are provided.

KEYWORDS: Terrorist Networks, Agent Based Modeling, 2004 Madrid Attacks, Backcasting, Computational Organization Simulation

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MASTER OF SCIENCE IN MANAGEMENT

LEASE VERSUS PURCHASE IN DEFENSE ACQUISITION

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With declining budgets and consolidation in the defense industry, should competition between prime and sub-prime contractors be fostered through innovative lease arrangements similar to the Navy's TAKX (Maritime Pre-positioning Force (MPF)) solution of the early 1980s? This thesis attempts to answer several questions. To what extent do current financial and managerial policies affect leasing and would changing these policies benefit both parties? Are there any benefits to leasing versus purchasing? Could leasing help the Department of Defense (DoD) control its budget? This thesis addresses the potential legislative action required to make long-term capital-lease options palatable to both investors and the Department of Defense, while allowing for continued congressional oversight of the procurement process. This research draws upon a multitude of papers, documents, and other resources to deliver an acceptable answer to these questions. The research presented also attempts to identify where and why leasing can be a viable option to the acquisition process. The research also reviews an example where leasing has proven to be effective and continues to be a viable alternative to full, up-front procurement in the acquisition process. That process, however, was started and completed under earlier rules governing the lease of capital assets.

KEYWORDS: Lease, Purchase, Defense Acquisition

EARMARK REFORM WITHIN THE 110TH CONGRESS: POLICY, TRANSPARENCY, AND EFFECTIVENESS

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Earmark spending has come under attack by and scrutiny of government watchdog groups, the media, and some fiscal conservatives in Congress because of the political corruption that has centered on its use, the increase in the amount of new earmarks being requested and funded, and because of the waste thought to be associated with earmarked spending. As a result, Congress has considered a series of earmark reforms, focused primarily on reforming Senate and House rules to ensure better control of the appropriations process and also provide transparency and accountability of all earmark requests and spending. Of the numerous reform bills and resolutions introduced in the Senate and House during the 110th Congress, one bill and one resolution became law. The Honest Leadership and Government Act of 2007 was intended to provide greater transparency of earmarks requested during committee mark-ups and in conference. House Resolution 491, "Providing for Earmark Reform," discouraged the unauthorized insertion of earmarks into the language of conference reports. Although total earmarked spending and the number of earmarks declined slightly following passage of these measures, there is little evidence to

suggest cause and effect. This was apparent after the passage of the FY2009 spending package, when congressional leaders were criticized for failing to offer lawmakers and the public sufficient time and opportunity to adequately scrutinize all earmark requests.

KEYWORDS: 110th Congress, Accountability, Appropriations, Earmarks, Earmark Reform, Transparency

AN ECONOMIC ANALYSIS OF POST-TRAUMATIC STRESS DISORDER IN THE GLOBAL WAR ON TERRORISM

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This thesis addresses the trend analysis of post-traumatic stress disorder (PTSD) prevalence across the different branches of the armed services in the U.S military between FY2001 and FY2006, as well as the effects of deployment characteristics on the probability of being diagnosed with PTSD among the active duty service personnel in the different branches. This study highlights the patterns of the co-morbidity and treatment costs of PTSD across the different branches of the armed services.

The data used in the thesis are provided by TRICARE, the Department of Defense's health care system, and the Defense Manpower Data Center, to obtain the demographics, deployment characteristics (deployment location, deployment frequencies, deployment duration) and inpatient and outpatient medical information and services rendered by physicians for all active duty service personnel diagnosed with PTSD between FY2001 and FY2006.

KEYWORDS: PTSD, Probit Regression, Deployment Effects, Trend Analysis

IMPLEMENTATION AND UTILIZATION OF SECTION 1206 OF THE NATIONAL DEFENSE AUTHORIZATION ACT FOR FY2006 AND BEYOND

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Section 1206 of the 2005 National Defense Authorization Act established a new program giving the Department of Defense (DoD) the authority to spend up to $200 million to train and equip foreign militaries to undertake counterterrorism or stability operations. This is the first major DoD authority for training and equipping other military forces. The DoD previously trained and equipped foreign military forces through State Department programs that were considered cumbersome and ineffective. In FY2006, the DoD and the State Department were given about $100 million for nine projects involving 15 countries; these projects were directed, administered, and supervised by the Defense Security Cooperation Agency. In some cases, Section 1206 has proven effective in countering terrorist activity in countries receiving assistance. Opponents of the policy argue that it inappropriately gives the DoD power to affect foreign policy. In the last three years, the DoD has bypassed State Department approval on some projects that may have been in the interest of national security but not foreign policy. Opponents of the policy want assurance that the DoD is held accountable for how they implement Section 1206 and that Section 1206 projects are in accordance with U.S. foreign policy. However, when terrorists hide among the local population, the military must interact with civilians, thus blurring the line between defense and foreign policy.

KEYWORDS: Section 1206, Global Train and Equip Authority

INTEGRATING MONETARY AND NON-MONETARY REENLISTMENT INCENTIVES UTILIZING THE COMBINATORIAL RETENTION AUCTION MECHANISM

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This research addresses the potential retention and cost impacts of providing an optimal, individualized portfolio of non-monetary and monetary incentives to influence reenlistment and retention behavior in enlisted sailors by exploring three mechanisms for administrating enlisted retention: a purely monetary auction, a Universal Incentive Package (UIP) auction, and the Combinatorial Retention Auction Mechanism (CRAM).

The mechanisms are simulated, their outcomes are compared, and their respective strengths and weaknesses are explored. CRAM clearly outperforms the monetary and UIP auctions. Cost savings to the Navy range from 25 to 80% over monetary incentives alone.

Additionally, this research addresses the force-diversifying potential of CRAM. It is shown, for the sample used, that offering certain non-monetary incentives changes the demographic mix of sailors retained.

By allowing sailors to choose only those benefits which suit them, the Navy can eliminate the waste associated with unwanted benefits while at the same time empowering its members.

KEYWORDS: Retention, Flexible Benefits, Auction, SRB, Total Rewards, Non-Monetary Incentive, Selective Reenlistment Bonus

MASTER OF SCIENCE
IN
MECHANICAL ENGINEERING

VALIDATION OF A MOLECULAR DYNAMICS SIMULATION IN DETERMINING THE THERMAL CONDUCTIVITY OF A LANTHANUM ZIRCONIUM PYROCHLORE

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Semiconductors continue to shrink in size and are now nearing the performance limits of some traditional materials. Silicon dioxide, which has been used extensively as a gate insulator in MOSFETs, is one such material, and research is focusing on finding a suitable replacement with a high dielectric constant. Oxides of lanthanum and zirconium have been identified as possible successors, but these compounds have not been well studied. This thesis is the first step in learning more about the thermo-physical and electronic properties of a lanthanum zirconium pyrochlore. A classical, molecular-dynamics simulation is performed utilizing a semi-empirical, Buckingham, interatomic potential to model the van der Waals forces between the atoms in the system. These forces are combined with the electrostatic potential, and the motions of the particles are determined over a corresponding time history. The movement of the energy contained within the atoms is then analyzed using statistical methods to determine the thermal conductivity of the pyrochlore. This conductivity is then compared with experimental data to determine the validity of the simulation and potential function.

KEYWORDS: Lanthanum Zirconium Pyrochlore, Classical Molecular Dynamics Simulation, Thermal Conductivity, Gate Insulator, Semiconductors

AERODYNAMIC PREDICTIONS, COMPARISONS, AND VALIDATIONS USING MISSILELAB AND MISSILE DATCOM (97)

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Aerodynamic prediction software is often used in the early stages of missile systems designed to quickly and accurately estimate the aerodynamics of a wide variety of missile configuration designs operating over many different flight regimes. It is also possible to use these empirical packages to validate flight data collected from wind tunnel tests and other open sources. Analysis of such data provides users with insights to the performance of a particular missile system, and, if necessary, enables the development of an appropriate defense system.

Wind-tunnel test data on an SA-2 class missile modified by suitable modeling was provided by MSIC. This data set is the bench-mark for validating the Missile Datcom (97) empirical code used to compute the performance of the missile. The missile geometry is modeled using the interface MissileLab. A series of simulations for different flight operating conditions are carried out. The primary quantities compared are the axial force coefficient, C_A, and the skin friction coefficient, C_f. The results obtained and the geometry changes that became necessary to obtain reasonable agreement are described.

KEYWORDS: Aerodynamics, Predictions, MissileLab, Missile Datcom, Empirical, Flight, Missile, Coefficient

A STABILIZATION SYSTEM FOR CAMERA CONTROL ON AN UNMANNED SURFACE VEHICLE

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Seafox is an unmanned surface vehicle (USV) that is primarily used for maritime security operations. Currently, a remotely operated, vision-based camera is used to track a particular target while the USV approaches the intended target. While the USV is in motion, the hydrodynamic forces and mechanical vibrations make it difficult for the operator to lock onto the target at all times.

This thesis addresses this issue through the development of a self-compensated motion controller that uses geo-pointing to track and lock onto a target at all times. The disturbance data, as captured by the onboard IMU sensor, is used to establish parameters for the compensator. The compensated pan-tilt angles are fed to the vision-based camera through a PID controller.

The controller developed will enable the vision-based camera system to autonomously track the intended target independently of the motion of the USV.

KEYWORDS: Unmanned Surface Vehicle, USV, Geo-Pointing, Compensator, Vision Based Camera, Autonomous Tracking

HARDWARE-IN-THE-LOOP IMPLEMENTATION OF AN ADAPTIVE, VISION-BASED GUIDANCE LAW FOR GROUND TARGET TRACKING

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An adaptive guidance law of a vision-based target-tracking (VBTT) system was previously developed and implemented onboard a small, unmanned, aerial vehicle (SUAV) in order to track a ground target moving with a constant velocity. This work extends previous results by considering scenarios where the variation of target velocity, in both magnitude and direction, is used to excite the feedback control law for further robustness analysis. This provides essential insight on the sensitivity of the performance criteria indicated by the range-holding capability, navigation error and the convergence speed of the guidance law.

In addition, this thesis addresses the robustness of the SUAV guidance law to the generalized time-delay in feedback due to, for example, data processing or a communications lag. This thesis also extends the previously obtained results by introducing a multi-criteria optimization technique. The results obtained are first based on the numerical simulations implemented in SIMULINK and then in a high-fidelity, hardware-in-the-loop (HIL) simulation environment with Piccolo Plus AP in the control loop.

Initial steps in developing a vision-based HIL environment incorporating TASE gimbal, Piccolo Plus AP, a Pan-Tilt unit, and image processing software are presented. The work also includes motivation for the development, an overview of existing technologies, and initial implementation of low-level driving mechanism (drivers) for the realistic representation of the real-world environment.

KEYWORDS: Unmanned Aerial Vehicle, UAV, Vision Based Target Tracking, Autonomous Guidance, xPC Target, PC-104, Hardware in the Loop Simulation

GENERIC UNMANNED AIR VEHICLE MODELING TO OBTAIN ITS AERODYNAMIC AND CONTROL DERIVATIVES

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This thesis deals with two different software packages to obtain the aerodynamic and control derivatives for a generic unmanned air vehicle (UAV). This data has a dual application. First, it is required in the Mathworks' Simulink 6-degree-of-freedom model of a generic UAV to develop a robust controller and do a variety of trade-offs. Second, it is needed to tune the parameters of the existing real-time controllers, such as a Piccolo autopilot.

The first approach explored in this thesis involves using the LinAir software program developed about a decade ago at Stanford University; the second approach relies on the Athena Vortex Lattice package developed at the Massachusetts Institute of Technology. This thesis applies the two aforementioned packages to generate the aerodynamic data for two different-sized UAVs, SIG Rascal and Thorpe Seeop P10B, emphasizing the advantages and pitfalls of each approach. The data obtained is further compared with that of some other UAVs, such as BAI Aerosystems Tern and Advanced Ceramics Corp. Silver Fox. The thesis concludes with computer simulations based on the obtained aerodynamic data.

KEYWORDS: LinAir, Aerodynamics and Control Derivatives, Athena Vortex Lattice, Rascal, P10B, 6DOF, 6-Degree-of-Freedom

STRUCTURAL ANALYSIS AND OPTIMIZATION OF THE SUPPORT DEVICES USED FOR A PROXIMAL FRACTURE OF THE FEMUR

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The support system for a proximal fracture of the femur is studied by means of the finite element method. The support system of the Gamma III by Stryker is used for this study due to the versatility and simplicity of the system. The variance of each system is modeled to validate the results. Parametric studies between the models are conducted, and design improvements are then tested against the existing parameters. Given the material properties for the Ti-6 AL-4V support system and bone, the models are considered under two different load conditions. From these results, a recommendation can be made to the manufacturing and medical community as to the effective use of the Gamma III nail implant system for a proximal fracture in the femur.

KEYWORDS: Femur, Proximal Fracture, Gamma Nail, Finite Elements

MASTER OF SCIENCE
IN
MODELING, VIRTUAL ENVIRONMENTS, AND SIMULATION

WEB SERVICES INTEGRATION ON-THE-FLY

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In a net-centric environment, data, tools, and people operate in a distributed network. A key research question is whether a software framework can become so usable and intelligent that integration of web services can be done on-the-fly as self-integration. Given data, software agents and supporting software infrastructure, web services integration on-the-fly means that human coding is not required to integrate web services into a Web Service Architecture. This thesis explores a generic, flexible, scalable, usable, and intelligent web-services architecture framework that enables sharing and integration of data and tools on-the-fly. This software framework is a key enabler for systems of systems architecture in a net-centric environment. The envisioned Web Service Architecture Intelligent Framework (WSAIF) is applied to the modeling, virtual environments, and simulation domain. Specifically, the framework is applied to provide the capability to search and retrieve visualization models and their matching behavior models in a collaborative environment.

This thesis elaborates on the design, implementation, deployment, and test results of web services for the Scenario Authoring and Visualization for Advanced Graphical Environments (SAVAGE) archive, which is a set of web-based 3D-graphics models plus corresponding agent-behavior models. SAVAGE web services can perform both "find" and "get" operations for models in the archives. SAVAGE web-services operations can be composed to form business processes. These business processes can be expressed using modeling techniques, such as the Web Service Business Process Execution Language (WSBPEL). Future capabilities include semantic activities using the Web Ontology Language for Services (OWL-S). The study and comparison of various modeling techniques that enable integration, orchestration, and adaptation of composable web services is mentioned. The design and implementation approach matches industry best practices for information architectures. The modeling techniques are essential to and will eventually be used in WSAIF orchestration and adaptation components. This thesis further explores how WSAIF software agents, modeling data, and supporting software infrastructure can someday enable web services integration on-the-fly. Recommendations for future work are provided.

KEYWORDS: Service Oriented Architecture, Web Services Architecture, Semantic Web Services, Software Agents, X3D Graphics, SAVAGE Model Archives

IMPROVING MARITIME PREPOSITIONING FORCE OFFLOADS USING MODELING AND SIMULATION

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The Marine Corps' Maritime Prepositioning Force (MPF) marries fly-in troops to their gear in an expeditionary environment. The arrival and assembly operation underneath this larger umbrella of MPF operations proves to be a somewhat chaotic, definitively complex, and dynamic logistics operation. Currently, no mechanism exists to simulate this process, with the eventual intention being the creation of a common operating picture (COP) that can be tailored to a given MPF offload or regeneration. This thesis creates a simulation of an MPF offload that can be used to more scientifically determine an optimal constitution of the force supporting this operation based on the quantity of rolling stock offloaded and the locations of each event in the process. A base and second scenario are created in the simulation program Viskit to prove the viability of such a simulation. This thesis concludes that the construction of a discrete event simulation (DES) for this logistics process improves planning and analysis of this time-sensitive operation. Finally, this thesis recommends that future work be performed in the area of converting this DES into a graphics environment in order to visually track principle end-items as they move throughout the logistics process, giving logisticians and commanders better visibility of the movement of gear, supplies, and personnel on the ground.

KEYWORDS: Maritime Prepositioning Force, Viskit, X3D, Operational Logistics, Modeling and Simulation, MOVES

PLANS VALIDATION USING DISCRETE EVENT SIMULATION AND AGENT-BASED SIMULATION

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Military plans validation is typically a long-drawn process requiring planners to validate their plans using anticipated scenarios or military exercises. While military exercises provide a realistic simulation of the plan, it is often the most expensive way of validating a plan. On the other hand, although using anticipated scenarios is relatively cheaper, the robustness of the validated plans is dependent on the extensiveness of the scenarios that they are validated against.

This thesis explores the possibility of using a multi-agent system (MAS) to generate the aggressor's air strike plans, which could be coupled with a low-resolution, discrete event simulation (DES)-based, air-defense simulator to augment human planners in their plans validation. An MAS-based strike-plan generator is built based on the tactics described in air strike doctrines. A DES-based air-defense simulator is also built to provide an agent environment by modeling the behavior of air defense assets and their interactions with the aggressor's fighters.

The resulting system demonstrates the ability to validate air defense plans using MAS-generated strike plans and a low-resolution DES-based simulator. It also provides a platform to assist air defense planners in foreseeing the action, reaction, and counteraction dynamics of their air defense plan against a possible range of strike plans.

KEYWORDS: Discrete-Event Simulation, Agent-Based, Plans Validation, Air Defense

MASTER OF SCIENCE
IN
OPERATIONS RESEARCH

EXPLORING FIRST RESPONDER TACTICS TO A TERRORIST CHEMICAL ATTACK

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The use of agent-based simulation (ABS) allows government emergency planners to analyze urban counterterrorist operations and observe environmental behaviors that may not obviously demonstrate themselves in a live simulation. This study demonstrates a framework in which future counterterrorism-response procedures can be analyzed for training and development. The study analyzes the acute phase of an emergency response to a terrorist bomb and chemical attack in an urban commercial setting. Using the ABS platform Pythagoras, explosive and chemical agent effects, civilian behavior, and responder tactics are represented in the simulation. Using a nearly orthogonal Latin hypercube (NOLH) design to analyze four attack scenarios rendered in the simulation, data farming techniques identify the most significant controllable and uncontrollable factors related to estimating percentage injury and death. Statistical comparisons indicate that a marginal increase in the percentage of injured civilians is associated with an emergency response. Specific emergency response elements may have a direct or inverse relationship to civilian survivorship. Given the independent, emergent behavior of the civilian population, functions supporting containment and evacuation may conflict with each other. This suggests the need to improve crowd management at the perimeter of the security cordon, particularly, the need to differentiate between those who were affected by the bomb or chemical gas and those who were not affected.

KEYWORDS: Agent Based Simulation, ABS, Multi-Agent Simulation, MAS, Pythagoras, Counterterrorism, Emergency Response, Nearly-Orthogonal Latin Hypercube, NOLH, Sarin, IED, Data Farming, Regression Tree, Cluster Analysis

A METHODOLOGICAL APPROACH FOR CONDUCTING A BUSINESS CASE ANALYSIS OF THE ZEPHYR JOINT CAPABILITY TECHNOLOGY DEMONSTRATION

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Zephyr, a high-altitude, long-endurance, solar-powered, unmanned, aerial vehicle (UAV) is identified as a Joint Capability Technology Demonstration (JCTD) candidate. This program is managed by the Office of the Secretary of Defense and is sponsored by the U.S. Central Command and the U.S. European Command. This program aims to accelerate the development and operational evaluation of the Zephyr concept so that the system can transit to production and be deployed in the field to address military needs in the quickest possible time.

The objective of this study is to analyze the return on investment (ROI) of the Zephyr system. This is achieved by: 1) developing a model to carry out a business case analysis (BCA) of JCTDs, including defining the methodical structure required in the business case report; and 2) conducting a Zephyr JCTD BCA, with a baseline analysis, followed by sensitivity and quality risk assessment for the Zephyr system.

The BCA compares the life-cycle costing with the Global Observer (a liquid-hydrogen-fueled UAV) in operational scenarios over a period of 15 years.

KEYWORDS: Zephyr, Solar Powered Unmanned Aerial Vehicle, UAV, Business Case Analysis, Joint Capability Technology Demonstration, JCTD, Life Cycle Costing

THE EFFICIENT EMPLOYMENT OF AN ADAPTIVE SENSOR

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A sensor that is subject to false positive and false negative errors is considered. The sensor searches for threat objects, such as ballistic missile launchers or improvised explosive devices. The objects are located in a certain area of interest, which is divided into area-cells. The area-cells are defined such that each of them may contain, at most, one threat object. The task of the sensor is to determine if an area-cell contains a threat object, and the objective of the searcher is to maximize the number of correctly determined area-cells.

Since definitive identification of a threat object, and subsequent handling of that threat, is done by a limited number of available ground-combat units, the correct determination of an area-cell is crucial for better allocating and directing these scarce resources. An algorithm is developed, rooted in the theory of large deviations and stochastic approximation theory that provably leads to the optimal search effort – allocation that maximizes the expected number of correctly determined area-cells – as the search budget becomes large.

KEYWORDS: Adaptive Sensor, Stochastic Approximation Algorithm, Adaptive Algorithm

DEVELOPMENT AND TESTING OF A NEW AREA SEARCH MODEL WITH PARTIALLY OVERLAPPING TARGET AND SEARCHER PATROL AREAS

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In this study, a MATLAB simulation is used to develop and test a generalization of the traditional random search model, which allows both the searcher and the target to move and to be in different (but overlapping) areas. In addition, the best evasion speed for a randomly moving target against a systematic search is studied.

KEYWORDS: Random Search, Exhaustive Search, Systematic Search, Search and Detection, MATLAB Simulation

DEFENSE AGAINST ROCKET ATTACKS IN THE PRESENCE OF FALSE CUES

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Rocket attacks on civilian and military targets, from both Hezbollah (South Lebanon) and Hammas (Gaza strip) have been causing a major operational problem for the Israeli Defense Forces for over two decades.

In recent years, U.S. forces are facing similar attacks in Afghanistan and Iraq against both remote military outposts and in the heart of Bagdad ("Green zone"). The insurgents are using mortars and short-range rockets, whose launch platforms have a very low signature prior to launch. The insurgents have adopted a "shoot and scoot" tactic, making it hard to detect them in time to retaliate effectively. In this thesis, a new analytic probability model that addresses this tactical situation is presented. The defender's decision tradeoffs are explored and quantified. A new counter-mortar/rocket tactic is suggested and explored using the probability model. An extended simulation model is developed to explore the situation when the defender is using a sensor that is subject to false-positive detections.

KEYWORDS: Stochastic Model, Missile Defense, Stochastic Duel

ON SOME MARKOVIAN SALVO COMBAT MODEL
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Markov-based probability models are presented for two important problems related to current combat situations: 1) fire allocating of salvos against multiple targets, and 2) improvised explosive devices (IED) attacks on convoys transporting supply and troops. For the fire allocation problem, a certain shooting tactic, called Persistent Shooting, is suggested, and the effect of various engagement parameters is explored using a discrete time Markov chain. The scenario where a single shooter engages a set of targets by a series of salvos is considered. The shooter has a limited number of munitions to deliver, and the question is how to allocate the fire in the presence of limited BDA capabilities. For the IED problem, the effect of various tactical parameters on the IED threat and on the resulting attrition of the friendly force is explored using a continuous-time Markov chain.

KEYWORDS: Stochastic Model, Target Acquisition, Shooting Strategy, Shooting Tactics, Fire Allocation, Markov Chain, Operational Planning

THE EFFECTS OF TERRAIN ON A SYSTEM OF SYSTEMS
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Modern combat operations are predominantly joint or combined arms, in which different forces and weapon systems come together to fight as a single entity—as a system composed of many different systems. For land forces, system of systems typically exists at battalion and above-sized forces. This thesis investigates the effects of two types of terrain (urban and rivers) on combat operations. Using a synthesis of various simulation techniques (rapid scenario generation (RSG), red teaming, experimental design, data analysis, and cluster and outlier analysis), 2,827 of these operations are simulated to understand how the individual systems perform and to provide insights into the effects of terrain on battle outcomes. With the operational scenario requiring the simulation of force sizes that are the largest ever attempted (battalion and brigade for the urban and river crossing scenarios, respectively) in Map Aware Nonuniform Automata (MANA, an agent-based simulation environment), an RSG tool is developed. This tool allows future MANA users to easily create combat models at the systems level. Results indicate that both types of terrain are disadvantageous for the attacker, especially the urban terrain. It is found that success in the attack relies critically on the survivability of armor protection, specifically, to be able to survive at least three good shots from anti-armor weapons. In addition, for both the defender and attacker, responsive communication is identified as a key determinant of battle outcome, and a threshold of less than 1.5 to 2 minutes is required for communication to be effective in enabling effective, indirect fires.

KEYWORDS: Design of Experiments, System of Systems, Simulation, Network Enabled Warfare, Rapid Scenario Generation, Combat Modeling

A BUSINESS CASE ANALYSIS OF THE HARD TARGET VOID SENSING FUZE (HTVSF) JOINT CAPABILITY TECHNOLOGY DEMONSTRATION (JCTD)

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The Hard Target Void Sensing Fuze (HTVSF) is a Joint Capability Technology Demonstration (JCTD) initiative that is being managed by the United States Strategic Command. The JCTD program seeks to accelerate the development and operational evaluation of mature and maturing technologies and rapidly transit new capability to address military problems. HTVSF is a programmable smart fuze that shall comprise several modes, capable of counting the number of "voids" or levels it passes through and functioning based on time delay. It aims to enhance weapon effects by detonating the PGMs, namely Guided Bomb Unit missiles (GBU-24 and GBU-28), with penetrator warheads such as BLU 109 and BLU 113 (Bomb Live Unit) at the desired location by functioning reliably after penetrating >10000 psi concrete.

The purpose of this study is to analyze the cost savings and benefits of implementing the HTVSF capability. A business case analysis is conducted, including a baseline analysis and an extensive sensitivity analysis focusing on the ROI of HTVSF and its capability to support transition decisions of HTVSF JCTD.

KEYWORDS: Hard Target Void Sensing Fuze, Business Case Analysis, Joint Capability Technology Demonstration, JCTD

DETERMINATION OF COST DRIVERS FOR SHIP OPERATIONS (1B1B) CONSUMABLE (SO) OPERATIONS TARGET ACCOUNTS FOR AMPHIBIOUS ASSAULT SHIPS

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This thesis conducts an analysis of amphibious assault ships consumable ship's OPTAR disbursements for the period of 1 July 2007 to 30 April 2008. Regression analysis is used to test for a statistical relationship among total monthly disbursements by Federal Supply Group (FSG) code and various demographic information, monthly maintenance, and training figure-of-merit scores. Monthly disbursements are aggregated by total monthly FSG investment for each ship in each month. Demographic information includes ship's homeport, class, Fleet Response Plan employment, age, inspection cycle, and maintenance cycle.

The thesis also analyzes past obligation data (by Julian-dated document number) for the period of 1 October 2005 through April 2006, which includes the same demographic information previously described. This portion of the analysis determines no quarterly spending cycles, but does identify large spikes in obligations at the end of each fiscal year, an expected result.

The regression analyses do not indicate a strong statistical relationship between monthly disbursements (by FSG) and demographic or figure-of-merit scores. Recommendations for further study include analysis of the distribution of available funds and what was purchased and analysis of a ship's unfunded and phased replacement listing and end-of-year obligations.

KEYWORDS: Consumable OPTAR, Amphibious Assault Ships, Federal Supply Group, FSG, Training Figure of Merit, TFOM

MASTER OF SCIENCE
IN
PHYSICAL OCEANOGRAPHY

THE INFLUENCE OF WIND ON HF RADAR SURFACE CURRENT FORECASTS

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The ability to predict surface currents can have a beneficial impact in several activities, such as search and rescue and oil spill response, as well as other, more purely scientific, operational, or economic endeavors. The Naval Postgraduate School, in conjunction with the Romberg Tiburon Center and the University of California-Santa Barbara, has been studying this purpose for the Coastal Response Research Center, University of New Hampshire, and the National Oceanic and Atmospheric Administration. So far, the prediction was based on tide and persistence of the reminiscent current. Faced with increasing error under changing environmental conditions, further study of other influences became fundamental, in order to increase reliability. This study is a part of that effort by studying the impact of wind-induced currents on forecasting.

Based on a year and a half of wind and HF surface current readings, the wind surface current interaction is analyzed and quantified. That influence is plugged into the forecast algorithm. The final results show that the wind-driven surface current is about 2% of the wind magnitude rotating around 50º clockwise, with coherence after 17h. The wind introduction into the forecast improves accuracy, but only by an average of 10%. The error still climbs with the variability of the environment, but knowing the wind influence allows other factors' influences to be observed more accurately, such as the magnitude of the current itself. Forecasting is now done with 0.15 m/s plus or minus 0.1 m/s at 95% confidence.

KEYWORDS: Surface Current, Wind, HF Radar, Forecast

MASTER OF SCIENCE
IN
PHYSICS

IMPLEMENTATION AND EVALUATION OF AN INS SYSTEM USING A THREE DEGREES-OF-FREEDOM MEMS ACCELEROMETER

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Position determination is one the most important aspects of navigation for an autonomous vehicle and can be accomplished through a variety of methods. Advances in global positioning system (GPS) technology, improved accuracy by a Wide Area Augmentation System (WAAS), wider coverage, easy integration, and low cost make GPS the most preferable alternative for navigating autonomous vehicles. However, an autonomous vehicle must be able to navigate and determine its position on earth without external navigation aids, such as GPS, Loran, and Transit. A method of inertial navigation called dead reckoning, where the robot calculates its position from a known reference using laser range finders, gyros, shaft encoders, and accelerometers, becomes more important for navigation with no external aids.

This thesis examines the navigation ability for robots using a three degree-of-freedom accelerometer, which can sense the instantaneous accelerations in three dimensions. Tests and results of the accelerometer as an inertial system for a mobile robot are implemented in 1D and 2D. The results demonstrate that the Crossbow MEMS accelerometer can be used for a distance of 10 meters for mobile, robot navigation with different levels of errors according to the path followed in 2D.

KEYWORDS: Autonomous Navigation, Dead Reckoning, Accelerometer

A STUDY OF THE CORRELATION BETWEEN DISLOCATIONS AND DIFFUSION LENGTH IN INGAP SOLAR CELLS

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A quantitative, contact-free method for extracting minority-carrier diffusion length is used to measure the relatively small variations in diffusion length associated with dislocation bands in mismatched epitaxy in the p-type region of a two-dimensional heterostructure of a triple junction (InGaP/GaAs/Ge) solar cell sample. These measurements are taken using the line scan mode of a scanning electron microscope coupled with an optical microscope.

This technique allows the variations in diffusion length in the [redacted] sample to be measured to within 0.1 microns. Also, the variations are not random, but are varied spatially with respect to the light and dark cathodoluminescence bands on the sample. However, there is an inverse relationship between the maximum luminescent intensity and the diffusion length. Since the radiative lifetime and non-radiative lifetime are on the same order of magnitude, a relationship between the maximum luminescent intensity and minority-carrier diffusion length to the lifetimes is derived. With the radiative lifetime inversely dependent on the free hole concentration, a simulation is conducted to qualitatively reproduce the relationship between luminescent intensity and minority-carrier diffusion length.

The model simulates the non-radiative lifetime and free hole concentration decreasing across dislocation bands. This describes the behavior of the non-radiative lifetime due to defect states associated with the dislocations. It also qualitatively illustrates the increase in radiative lifetime if the free hole concentration is reduced due to variations in the Fermi level. Therefore, the simulation qualitatively describes the spatial behavior of the diffusion length due to the presence of dislocations and reproduces the experimental anti-correlation between the diffusion length and maximum luminescent intensity. Areas of further research are offered to expand this work to other triple-junction solar-cell materials, including the effects of lattice mismatched materials, varying mole concentrations, atomic ordering, and doping concentration.

KEYWORDS: Triple Junction Solar Cells, Ingap, Solar Cells, Semiconductor, Diffusion Length, Transport Imaging, Cathodoluminescence, Dislocations, Radiative Lifetime, Non-Radiative Lifetime, Free Hole Concentration

MASTER OF SCIENCE
IN
PROGRAM MANAGEMENT

IMPROVING PRODUCT PERFORMANCE THROUGH NEW EQUIPMENT TRAINING TECHNIQUES

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The U.S. military develops and fields infantry clothing and equipment (ICE) to protect ground warfighters against a myriad of environmental and man-made battlefield threats. ICE also augments physical activities to overcome identified battlefield deficiencies; increase survivability, lethality, mobility, and sustainability; and improve combat effectiveness. More often than not, the maximum performance capabilities engineered into newly fielded ICE are not fully utilized to benefit the military user.

The ICE training problem for the United States Marine Corps (USMC) is examined to identify practical and strategic changes in instruction, process, and procedures that will help a Marine realize the full performance potential of new ICE issued to him/her. The improved ICE training strategy recommends implementing six corrective actions that will collectively increase a Marine's ability to notice ICE training, improve his/her ability to understand its training message, and reinforce newly gained ICE knowledge to habitually use ICE correctly. The training approach principles should also be applicable to the United States Army, whose soldiers similarly experience under-utilized capabilities from their combat clothing and equipment.

KEYWORDS: Adult Learners, Generational Preferences, Infantry Combat Equipment, ICE, Message Stickiness, New Equipment Training, NET, Standard Based Instruction, SBI, Train as You Fight

MASTER OF SCIENCE
IN
SOFTWARE ENGINEERING

ACOUSTIC IMAGE MODELS FOR NAVIGATION WITH FORWARD-LOOKING SONARS

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Cost and miniaturization of autonomous unmanned vehicles (AUV) drive component reuse and better sensor data analysis. One such component is the forward looking sonar (FLS), which can be used for obstacle avoidance and to extract vehicle state information. However, autonomous feature extraction of images from the FLS is difficult due to the noise inherent in the sensor and the sensor's susceptibility to interference from other acoustic devices.

This thesis investigates techniques to detect and classify common acoustic-noise artifacts and common objects in a single frame. Other techniques require three or more frames to filter objects from other noise sources. A combination of probabilistic and template-based models is used to successfully detect and classify acoustic noise and objects. One common noise source is the micro modem, which is detected 100\% of the time with 1\% false positives. Objects such as the ocean floor are correctly classified more than 93\% of the time in most sites.

Due to the short development timeframe, the software is developed with a two-stage approach. First, a high-level scripting language is used for rapid prototyping of different classification techniques. In order to meet the time-constrained requirements of the target software, the classification algorithms are encapsulated as C++ classes in an object-oriented design once the desired techniques are identified.

KEYWORDS: Computer Vision, Autonomous Vehicle, REMUS, BlueView, Rapid Prototyping, Acoustic Image Modeling, Sonar Image Analysis

MASTER OF SCIENCE
IN
SYSTEMS ENGINEERING

THE MATURITY CURVE OF SYSTEMS ENGINEERING
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Systems engineering is a profession, a philosophy, and a discipline that adopts an iterative and parallel problem-identification and solution-seeking process, coupled with a collaborative and integrated multi-disciplinary approach. It involves the lifecycle view of deriving functional solutions to the identified problems of the whole system and its dependants. The end-state is in the satisfaction of the requirements, timeline and budget by the stakeholders. Systems engineering requires the systems engineer to possess a series of traits that are academically and experientially acquired. The thesis looks at capturing the traits required via fuzzy logic scales and learning curves. The key observation is in the emphasis and need for certain traits at various levels of experience in the maturity cycle of a systems engineer. Learning curves are plotted to understand some of these traits. The experiential fuzzy-logic scale developed is used to draw a relation to traits as desired in the employment of a systems engineer. Using the studies from the literature reviews on learning curves, various learning curves are obtained for selected traits. For the differences in the start point, i.e., when these traits are desired in the employment of a systems engineer, there is a relationship between the power and coefficient of the curves to the start-point.

KEYWORDS: Systems Engineering, Traits, Fuzzy Logic

ENHANCING THE COMBAT SURVIVABILITY OF EXISTING UNMANNED AIRCRAFT SYSTEMS
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The importance of unmanned aircraft systems (UAS) to warfighters has been growing. Each loss (regardless of whether the entire UAS or parts of it) has become more expensive and unaffordable in both an operational and monetary sense. An unmanned aircraft (UA) loss may mean that critical missions cannot be performed and millions of dollars of investments on the UA are lost. As most existing UAS were designed to be inexpensive and expendable, there is a need to enhance their combat survivability. Combat survivability is the capability of the UAS to avoid or withstand a man-made, hostile environment. This thesis explores how to enhance the combat survivability of existing UAS. Potential survivability enhancement options are identified. These options include changes in tactics, improving the situation awareness of the operator, equipping the UA with the capability to counter an incoming threat, improving the payload performance, and improving resistance of the data link to jamming. The technology behind these options, as well as the favorable and unfavorable factors of the options, are studied and discussed. This thesis also proposes a process for selecting the "best" solution from survivability enhancement alternatives. This thesis uses systems engineering methodology to enhance the survivability of existing UAS.

KEYWORDS: Systems Engineering, Unmanned Aircraft System, UAS, Unmanned Aerial Vehicle, UAV, Combat Survivability, Survivability, Survivability Enhancement

MASTER OF SCIENCE
IN
SYSTEMS ENGINEERING ANALYSIS

THE DIVERSIFIED SUBMARINE WEAPON SUITE: A SYSTEMS ENGINEERING APPROACH

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This thesis presents the conceptual design of a submarine weapon system using systems engineering methods and analysis. In order to ensure mission success and submarine survivability, a weapons system is required that is capable of engaging targets across the range of threats. The development of this system is demonstrated by deriving system requirements from high-level stakeholders, developing alternative designs that meet these requirements, and selecting the alternative that delivers the greatest performance. The analysis of alternatives employs a dynamic method of allocation, allowing input based on the threat priorities and estimated weapon performance, as well as weapon size. Alternative suites of weapons are then assigned to the constrained space aboard the submarine platform. After evaluating alternatives, the resulting system design, which reflects the highest performance among the alternatives, demonstrates the conceptual design that can be expected to show the greatest contribution to mission success and platform survivability. The resulting design includes the continued use of heavyweight torpedoes and Tomahawk cruise missiles, supplemented by Harpoon anti-ship missiles and AIM-9X Sidewinder missiles. The methodology used to arrive at this conceptual design for a submarine weapons system can be applied to a wide range of conditions in order to make informed decisions regarding future development.

KEYWORDS: Submarine Weapons, Torpedoes, Weapon Allocation, Weapon Selection, Systems Engineering, Submarine Littoral Operations, Submarine Roles and Missions

MASTER OF SCIENCE
IN
SYSTEMS TECHNOLOGY

A COMPARATIVE ANALYSIS OF WIKI DISCRETIONARY ACCESS CONTROL IN A CONOPS ENVIRONMENT

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This research conducts a comparative analysis of discretionary access controls of current wikis by experimenting with their discretionary access controls and functionality, comparing the wiki software cost of implementation, and comparing the scalability for possible enterprise use. Most importantly, the author analyzes wiki's discretionary access control capabilities and suitability in regards to which wiki will be more beneficial in a particular CONOPS. The derivation of the author's thesis focuses awareness on effective information allocation that is reliable and accurate, while maintaining its confidentiality based upon some level of discretionary access control (DAC). In the author's opinion, wiki technology enables near real-time information, fosters communities of practice (CoP), enhances collaboration, and reduces information stovepipes. Different wikis are examined to determine which wiki DAC implementations are most suitable for different CONOPS objectives. To determine the best wiki complement with CONOPS objective, tests are conducted and a comparative analysis is performed. The comparative analysis consists of DAC mechanisms and administrator functions.

KEYWORDS: Wiki, Collaboration, CONOPS, Discretionary Access Controls, C4I System Modeling, Communication Systems Modeling

MASTER OF ARTS

Security Studies

MASTER OF ARTS
IN
SECURITY STUDIES

HOW SHOULD MUNICIPAL POLICE AGENCIES PARTICIPATE IN AMERICA'S HOMELAND SECURITY STRATEGY?

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The majority of municipal law-enforcement agencies in the United States are not proactively contributing to America's homeland security, counterterrorism, or domestic intelligence efforts. These agencies – the country's most critical domestic security assets – sit idle on the homeland security sidelines as terrorism becomes increasingly prolific, lethal, asymmetric, transnational, and closer to our hometowns.

Seven years after 9/11, there is no nationwide, municipal-level network of homeland security professionals across the United States. There is no preventative-based, forward-thinking system for domestic intelligence collection. The vast majority of police departments lack homeland security or terrorism specialists. Furthermore, neither federal nor state strategy has clearly defined, specific, homeland security roles and responsibilities for municipal police departments.

As of this writing, there is no municipal-level homeland security strategy. Most importantly, no realistic federal or state strategy has been put forth that integrates all of America's homeland security assets – including municipal police officers – into a single, synergistic design.

This thesis examines three policy options and arrives at a conclusion as to which option America should implement to effectively protect its citizenry from terrorists. This thesis introduces the concept of "municipal homeland security" and defines the specific roles and responsibilities of municipal police agencies.

KEYWORDS: Municipal Homeland Security, MHLS, Municipal Homeland Security Strategy, MHSS, Municipal Homeland Security Program, MHSP, Municipal Homeland Security Officer, MHSO, Community Homeland Security Officer, CHSO, Municipal Homeland Security Network, MHSN

TRANSITIONS TO PEACE: EFFECTS ON INTERNAL SECURITY FORCES IN NICARAGUA, EL SALVADOR, AND GUATEMALA

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Second Reader: Robert E. Looney, Department of National Security Affairs

This thesis examines the effect of transitions to peace in Nicaragua, El Salvador, and Guatemala on internal security forces. It reveals how the influence of the military affected the implementation of internal security reforms, influencing the professionalism and effectiveness of police forces in the fight against violence and gangs today. The research shows that Sandinista influence allowed Nicaragua to maintain an experienced core of security personnel that has confronted the present challenges more effectively. Reforms in El Salvador yielded a new, highly restructured and reduced security force, of which only one-fifth of the

personnel possessed some policing experience, reducing the short-term effectiveness of the force in the fight against insecurity, but increasing the probability for long-term consolidation of a professional and effective police institution. In Guatemala, the transitions resulted in the creation of a new police force manned mostly by former security personnel, perpetuating the corruption that permeated the force prior to the transitions – a fact reflected in the high levels of crime in the country today. This thesis proposes that the effect of the transitions on the current forces is a pivotal factor in their effectiveness and must be addressed in order to improve security for citizens and democracy.

KEYWORDS: Nicaragua, El Salvador, Guatemala, Transition, Democracy, Violence, Gangs, Reform, Police, Central America, Peace Accord, Security Void, Corruption, Community Policing, Military

THE FATE OF SAUDI ARABIA: REGIME EVOLUTION IN THE SAUDI MONARCHY

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Samuel Huntington described the transformation process from an authoritarian regime to a democratic form of government as a direct transition. This model of transformation is applied to Saudi Arabia to analyze whether it is displaying characteristics that led other authoritarian regimes to democratization. The relationship between the regime and the population is evolving and is facilitated by external and internal forces that represent an overall push toward democratization. The internal pressures are a growing population, increasing educational levels, growing internet and modern technology usage, and an increasingly critical press. The external sources are the international political and economic world order, Islamic extremism, security concerns, and non-governmental organizations. Several segments of society, including the ulama, merchants, technocrats, expatriates, tribes, and women, are undergoing social changes that offer different political influences from what existed at the time of the creation of Saudi Arabia, and some of these groups demand more effective government. Several earlier attempts at liberal reforms failed to produce a lasting commitment and left the Saudi monarchy in total control. The social changes and internal and external forces will force the government to keep reforms in place to bring about an evolutionary change to a more liberal form of government.

KEYWORDS: Saudi Arabia, Democracy, Third Wave, Liberalization, Samuel Huntington, Authoritarian Regime

NORM EMERGENCE AND HUMANITARIAN INTERVENTION

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Despite efforts by the United Nations in the past two decades, the world has seen numerous intrastate conflicts emerge. Immediate worldwide reporting of such atrocities, evoking empathy for the plight of others, has led to an unseen measure of objection to repressive treatment, and the excuse of sovereignty as a defense against inhumane actions is being challenged. The relevance and importance of this topic is reflected in the origins of humanitarian intervention, the International Commission on Intervention and State Sovereignty's 2001 report, entitled *The Responsibility to Protect (R2P)*, and the United Nations' subsequent adoption of the report at the World Summit in 2005.

This thesis uses the constructivist approach to norms and norm development to investigate whether a norm of humanitarian intervention has emerged in the international system that is shaping the behavior of states. It proposes that norms develop in a three-stage life cycle. The author suggests that the norm of humanitarian intervention (since the end of the Cold War) has developed in a manner that was initially

consistent with the norm-life cycle, but more recently has deviated from the life cycle. This thesis explains why this is the case and discusses the implications of the norm of humanitarian intervention for international society.

KEYWORDS: Norms, Norm Life Cycle, Constructivism, Humanitarian Intervention, Responsibility to Protect, Articulation

THE STATE OF LEADERSHIP IN THE DEPARTMENT OF HOMELAND SECURITY – IS THERE A MODEL FOR LEADING?

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This thesis studies strategic leadership within the Department of Homeland Security (DHS). The study centers on the search for a leadership strategy that may be helpful for DHS leaders given their inherent organizational, functional, and technological challenges. The research entails an in-depth review of existing literature, along with interviews/focus groups with senior executives external to the DHS, senior executives within the DHS, and DHS managerial-level professionals.

This thesis argues that DHS leaders would benefit from an organizationally sponsored leadership strategy that supports the DHS' pursuit to secure the United States homeland. The findings of this research are based on key themes that are formed as a result of the research. These themes are presented as key findings and, in some cases, recommendations for how DHS leaders may be able to enhance both individual and organizational performance as the DHS carries on into the future.

It is found that there are leadership strategies that can help the DHS achieve a higher level of organizational and mission-oriented performance. The leadership strategy recommended is for the DHS to establish a leadership strategy that is not only linked to its overall business strategy, but is inherently part of its business strategy.

KEYWORDS: Leadership, Leading, Leadership Development, DHS Leadership Strategy

CONTINGENCY-FOCUSED FINANCIAL MANAGEMENT AND LOGISTICS FOR THE U.S. COAST GUARD

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The Coast Guard has had significant success conducting response operations during major contingencies. Yet mission execution has been buoyed and supported in an ad hoc fashion by the logistics and financial management structure of the organization. Should ad hoc efforts fail in the future, the Coast Guard may find itself unprepared for managing the logistical and financial challenges of widespread contingencies. Shortfalls in the existing approach to contingency preparedness include a lack of contingency-based financial and logistics policies, unprepared financial-management and cost-accounting mechanisms, a non-resilient financial-management community, a lack of geographically focused logistics plans for a range of contingencies, and operational and logistical professionals who are not adequately trained for contingency resource management.

Qualitative research and reviews of after-action reports indicate that there are solutions to these challenges. Recommendations include establishing policy on cost tracking, pre-contracting, and rapid procurement; modifying the financial systems' readiness to track costs; developing an information sharing

and collaborative construct with other units and agencies using a contingency logistics planning group; building resilience in contingency procurement through advanced readiness contracting and meeting the "human aspects" of business continuity planning; and reconfiguring the training for planners, logisticians, and procurement personnel.

KEYWORDS: Financial Management, Business Continuity, Disaster Preparedness, Disaster Logistics

AN INSTITUTIONAL ASSESSMENT OF ETHNIC CONFLICT IN CHINA

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Since its creation in 1949, the People's Republic of China (PRC) has had to deal with problems of ethnic conflict. This is due to China's large and diverse minority population, which accounts for approximately eight percent of the total population, or nearly 100 million people. From 1949 onward, the PRC has struggled to integrate these diverse people into a unified nation. Throughout this period the relationship between the Chinese government and many of the country's minorities has been fraught with conflict. This thesis examines the role of the institutions used by Beijing to manage its relationship with minorities in China. It includes a discussion of current theoretical research on ethnic conflict, a detailed explanation of the institutional approach to the study of ethnic conflict, and the application of this institutional approach to the Chinese case. In applying the institutional framework to the PRC's experience, this thesis examines the different ethnic-conflict-management strategies employed by Beijing from 1949 to the present. The response of China's minorities to each strategy is evaluated. Ultimately, this thesis concludes that the institutions used by the Chinese government since 1949 have not been effective in mitigating ethnic conflict in China. Additionally, this study demonstrates that the institutional approach is highly useful in understanding the causes of ethnic conflict in the Chinese case.

KEYWORDS: Ethnicity, Ethnic Conflict, Minority Groups, Minorities, People's Republic of China, Tibet, Xinjiang, Guangxi, Tibetans, Uyghurs, Zhuang

PREVENTIVE DETENTION IN THE WAR ON TERROR: A PLAN FOR A MORE MODERATE AND SUSTAINABLE SOLUTION

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After September 11, 2001, the Bush administration decided to detain certain individuals suspected of being members or agents of al Qaeda or the Taliban as enemy combatants and hold them indefinitely and incommunicado for the duration of the war on terror. The rationale behind this system of preventive detention is to incapacitate suspected terrorists, facilitate interrogation, and hold them when traditional criminal charges are not feasible for a variety of reasons. While the rationale for preventive detention is legitimate and the need for preventive detention is real, the current administration's approach has been reactionary, illogical, and probably unconstitutional.

This thesis explores the underlying rationale for preventive detention as a tool in this war on terror; analyzes the legal obstacles to creating a preventive-detention regime; discusses how Israel and Britain have dealt with incapacitation and interrogation of terrorists; and compares several alternative ideas to the administration's enemy-combatant policy under a non-partisan methodology that looks at questions of lawfulness, the balance between liberty and security, and institutional efficiency. In the end, this thesis

recommends using the Foreign Intelligence Surveillance Court to monitor a narrow regime of preventive detention to be used only under certain prescribed circumstances where interrogation and/or incapacitation are the justifications.

Note: This thesis was published as a book by Cambria Press in November 2008. The book is entitled *The Necessary Evil of Preventive Detention in the War on Terror: A Plan for a More Moderate and Sustainable Solution*. An excerpt of the thesis based on Chapter V was published by *Homeland Security Affairs* in October 2008 (http://www.hsaj.org/?article=4.3.1). An excerpt based on Chapters III and IV, entitled "The Why and How of Preventive Detention in the War on Terror," will be published by *The Thomas M. Cooley Law Review* in the spring of 2009.

KEYWORDS: Preventive Detention, Enemy Combatant, Unlawful Combatant, National Security Court, Foreign Intelligence Surveillance Act, Foreign Intelligence Surveillance Court

OVERCOMING THE ULAMA: GLOBALIZING IRAN'S POLITICAL ECONOMY

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In the nearly thirty years following the Islamic Revolution, two opposing forces – an isolated, conservative theocracy versus globalization – struggling to coexist have placed Iran in a precarious position where it will either move back towards the traditional ideologies that prompted such a radical transformation, away from the pressures, challenges, and interdependencies created through globalization; or towards more active participation in the outside world. The religious establishment, or ulama, plays the most significant role in the dichotomy between Iran's theocratic conservatism and the position Iran takes on globalization.

The modern history of Iran is replete with examples of the ulama actively participating in the political economy of the country, usually acting with their own interests in mind. Despite basing their actions within the theology and jurisprudence of Shi'a Islam, significant space exists within the principles of Islamic economic thought to allow the ulama in Iran to lead their country into the global economy. Yet the uncertainties and diffusion of power brought about through the processes of globalization keep the religious establishment from doing so in an effort to maintain their control over all Iranian institutions captured after the revolution.

KEYWORDS: Iran, Shi'a Islam, Globalization, Ulama, Political Economy, Islamic Economics, Free Trade

THE SECURE FENCE ACT: THE EXPECTED IMPACT ON ILLEGAL IMMIGRATION AND COUNTERTERRORISM

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September 11, 2001, was a watershed moment in American history; one that has catapulted national security back to the center stage. In response to the growing fears of terrorism and the heightened concern for illegal immigration that subsequently followed, President Bush signed the Secure Fence Act in October 2006, thus entangling two very distinct issues: counterterrorism and illegal immigration. The legislation authorized the construction of 700 hundred miles of double-layered fencing, in addition to cameras, ground radar, and improved lighting along the U.S.–Mexican border. The proposed border fence was designed to prevent "unlawful entry into the United States, including entries by terrorists, other unlawful aliens and

instruments of terrorism." This thesis examines the probable effectiveness of the border fence on illegal immigration and counterterrorism by analyzing other such structures in the context of these two very different phenomena. This study investigates the border fence in San Diego, California, and its affect on illegal immigration, and the security fence along Israel's border with Gaza and its effect on terrorism. The study suggests that fences can prove effective in curbing illegal immigration but are less successful in combating terrorism.

KEYWORDS: Border Security, Counterterrorism, Terrorism, Illegal Immigration, Secure Fence Act

TRANSPORTATION SECURITY LEADERSHIP: THE RIGHT STUFF?

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This thesis focuses on the evolving concepts of network leadership and managing by network. The Department of Homeland Security (DHS) and its agencies are faced with daunting, complex challenges in protecting the homeland. The Transportation Security Administration (TSA), as part of the DHS, also faces complex challenges in protecting U.S. transportation systems from terrorist threats. The growing complexity and global nature of terrorist networks require leadership that is collaborative, integrative, and able to take a holistic leadership approach. In the TSA, the Federal Security Director (FSD) position has a field leadership role in developing and supporting transportation security and anti-terrorism plans and activities with stakeholders across the nation. The FSD's mission is to build effective, multi-modal, transportation-security networks.

The findings support that network leadership is seen by FSDs, stakeholders, and TSA executives to be the future leadership model for transportation security. The issue focuses on which skills, paradigms, education, organizational strategies, and structures will allow FSDs to become skillful network leaders. Areas with the potential to strengthen network leadership in the TSA's Federal Security Director cadre include FSD role clarification, leadership culture and capacity, organizational structure and strategies, and a stakeholder collaboration framework.

KEYWORDS: Leadership, Leading, Network Leadership, Complexity Theory, Globalization

PUBLIC HEALTH PLANNING FOR VULNERABLE POPULATIONS AND PANDEMIC INFLUENZA

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This thesis addresses planning for vulnerable populations, those segments of each community that are normally independent but that may require special assistance during a health emergency, such as an influenza pandemic. An analysis of plans from 60 of Georgia's 159 counties provides insight into the extent to which vulnerable populations are defined and identified; relevant agencies are engaged in planning; and opportunities for improvement are identified. Recommended strategies will enable local jurisdictions to more effectively plan for vulnerable populations. Some strategies have now been implemented and others are in progress.

KEYWORDS: Public Health Planning, Pandemic Influenza, Vulnerable Populations

THE EFFECTS OF JAPAN'S APOLOGY FOR WORLD WAR II ATROCITIES ON REGIONAL RELATIONS

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This thesis explores the impact of atrocities that Japan committed against its neighbors during and prior to World War II on Japan's relationships with its neighbors, China and the Republic of Korea. Japan's wartime treatment of comfort women, the atrocities of the Rape of Nanking, and Japanese chemical and biological testing on humans remain issues of contention with the governments and people of China and the Republic of Korea, who feel that Japan has never fully apologized for its actions during World War II. They assert that Japan feels no remorse, as evidenced by treatment of World War II in Japanese school textbooks and by government officials visiting Yasukuni Shrine, where Japan's war dead are commemorated. The Japanese counter that they have offered sincere apologies. Consequently, this lingering animosity still affects Tokyo's efforts to achieve its foreign policy goals and expand its international influence, among other things, through seeking a permanent seat on the United Nations Security Council and by possibly amending Article 9 of its Constitution. Additionally, this discord affects Japan's regional relations. Japan, China, and the Republic of Korea all share an interest in regional stability, and their economies are inextricably linked. Nevertheless, discord over these historical questions complicates relations that are already strained by competition for natural resources and competing sovereignty claims.

KEYWORDS: War Guilt, World War II, Japan and China, Japan and Republic of Korea, Comfort Women, Rape of Nanking, Chemical and Biological Testing, Tokyo Tribunal, Japanese Textbooks, Yasukuni War Shrine, Japan Apology, Article 9

A BRIDGE OVER TROUBLED WATERS: THE VITAL ROLE OF INTELLIGENCE-SHARING IN SHAPING THE ANGLO–AMERICAN "SPECIAL RELATIONSHIP"

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Speaking to an American audience in 1946, Winston Churchill articulated the British desire for "a special relationship" with America, coining a term that has continued to define the shifting vagaries of collaboration and consonance between the United States and the United Kingdom. Churchill's statement underscores the historical importance of the Anglo–American relationship, an importance that has translated into unparalleled bilateral security cooperation through two World Wars and a Cold War, during ongoing conflicts in Afghanistan and Iraq, and toward the global security challenges that will doubtless arise in the future. This thesis unpacks the evolution of the "special relationship" in an effort to demonstrate the crucial role of intelligence sharing to the effectiveness of the Anglo–American partnership. Intelligence-sharing has been the scaffolding around which the particularity of the "special relationship" has always been constructed, from its inception in World War I until its present-day manifestation, and promises to be the key to the future of this uniquely intimate collaboration. Indeed, intelligence sharing has galvanized the "special relationship" posited by Churchill and its formidable role in world affairs. As suggested in this thesis, maintaining the clear but measured intelligence exchange responsible for the unique character of America's relationship to the United Kingdom remains vital to shaping the continued effectiveness of the Anglo–American "special relationship."

KEYWORDS: Intelligence, Intelligence Sharing, Anglo–American Relations, Special Relationship

THE EFFECTS OF NATIONAL POLICY ON REFUGEE WELFARE AND RELATED SECURITY ISSUES: A COMPARATIVE CASE STUDY OF LEBANON, EGYPT, AND SYRIA

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The growing and persistent nature of today's protracted refugee situations poses significant threats to the host countries and regions that support these vulnerable people. While stateless, refugees fall under the protection of the international community and its laws. However, it is the effects of state policy that actually shape the living conditions and opportunities available for refugees, in turn influencing the security repercussions they can set in motion.

This thesis examines the relationship between the tendency of state policies regarding Palestinian refugees in Lebanon, Egypt, and Syria to create isolation or integration, and the relative extent of national and regional security issues and concerns surrounding refugees within their respective territories. From these relationships, this study determines that national policies that effectively contribute to integrating refugees into the host society, as opposed to isolating them, will greatly reduce the security consequences of hosting refugees.

KEYWORDS: Palestinian Refugees, National Refugee Policy, Refugees in Lebanon, Refugees in Egypt, Refugees in Syria, Refugee Law

THE ECONOMIC IMPACT OF THE HOMELAND SECURITY ADVISORY SYSTEM: THE COST OF HEIGHTENED BORDER SECURITY

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The majority of literature written on the economic impact of border security has indicated that the increased security following 9/11 has had adverse effects on the flow of foreign imports. This study measures the direct cost the Homeland Security Advisory System (HSAS) had on U.S. Customs and Border Protection (CBP) overtime spending and the indirect cost on the U.S. economy by reducing the daily flow of imports. Three case studies are conducted at the United States' largest ports of entry. Each compares CBP overtime spending and the daily flow of imports during the seven periods the HSAS was elevated to ORANGE between 2002 and 2005. The study finds that increased threat levels of the HSAS resulted in 50% more overtime spending by CBP. However, the HSAS had no impact on the daily flow of imports into the United States during the seven periods of elevated security between 2002 and 2005.

KEYWORDS: Homeland Security Advisory System, Economic Impact of Border Security, U.S. Customs and Border Protection, Ambassador Bridge, World Trade Bridge, Port of Los Angeles, Port of Long Beach

PUBLIC/PRIVATE PARTNERSHIPS WITH HAZARDOUS-MATERIAL MOTOR CARRIERS: CREATING INCENTIVES TO INCREASE SECURITY THROUGH ASSESSED RISK

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On September 11, 2001, terrorists used commercial airliners as weapons of terror inside the United States, and America's approach to security was forever changed. While commercial airliners were the weapons of choice on that day, the 9/11 Commission recognized that Al Qaeda and other groups had, prior to the use of airlines, used suicide vehicles, namely truck bombs, to commit terrorist acts.

The threat from hazmat trucks continues today. There can be no doubt that terrorists are interested in using hazmat trucks as weapons within the borders of the United States. In 2004, Defense Secretary Donald Rumsfeld's visit to Iraq was punctuated by a fuel-truck attack that burned a section of Baghdad. More recently, terrorists in Iraq have repeatedly used chlorine-based truck bombs as a weapon in the Iraq war.

The Department of Transportation recognizes that hazmat trucks are "dangerous and ready-made weapons" and are "especially attractive" to terrorists. Stephen Gale, a University of Pennsylvania professor and terrorism expert, agrees that hazmat trucks are essentially ready-made bombs that are "tailor-made" for terrorists to conduct an attack at the lowest cost and with the greatest impact. In fact, terrorism experts consider trucks to be one of the best tools a terrorist can use to breach security measures and carry explosives since the U.S. airline industry significantly increased security procedures.

The ability of the government to secure every hazardous-materials motor carrier against terrorist attack is severely limited, yet the potential that hazardous materials trucks will be used in terrorist attacks is great. Therefore, it is important to consider whether the security of hazardous-materials motor carriers can be improved voluntarily and quickly by realigning existing resources and instituting a plan that leverages market forces and other incentives.

This thesis introduces a unique, voluntary, incentive-based program, Security Through Assessed Risk (STAR), which can be used to increase security for a vast number of presently under-protected, hazardous-materials motor carriers. It explains how TSA can leverage existing resources and successful ideas from both the private sector and governmental programs to rapidly and significantly enhance the security of hazardous-materials motor carriers.

KEYWORDS: Hazardous Materials Motor Carrier, Motor Carrier, Trucking, Hazardous Materials, Hazmat, Incentive, Partnership, Public/Private, Voluntary, Security, Risk Assessment

ACHIEVING INTELLIGENCE PROLIFERATION: POLICIES AND PROGRAMS FOR LEVERAGING INTELLIGENCE SUPPORT TO STATE, LOCAL, AND TRIBAL LAW-ENFORCEMENT

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The need to proliferate intelligence to all appropriate levels of society is an imperative that has been all too vividly illustrated by the attacks of 9/11. Terrorism cuts across all levels of society through loss of life, economic chaos, and inhibiting freedoms. The horrific loss of life cannot be minimized or discounted, but the damage goes further and its effects are enduring. Estimates of the future economic impact of terrorism, based on 9/11 losses, range from 100 million to 100 billion dollars per year. These numbers do not quantify the emotional toll or the self-imposed loss of personal freedom that attacks the very nature of democracy.

The prolific nature of terror calls for an equally prolific response. This thesis argues that in order to proliferate the intelligence that will connect the dots and mitigate future terror attacks, all aspects of the intelligence enterprise must be leveraged to form a collaborative intelligence community that includes federal, state, and local law-enforcement, as well as private sector partners. The policies and programs examined in this thesis identify information sharing as the chief enabler of leverage. The premise is that the more information shared, the more intelligence is produced. This positive relationship drives the concept of intelligence proliferation.

KEYWORDS: Information Sharing, Intelligence, Fusion Centers, Intelligence Led Policing, Homeland Security, Intelligence Proliferation

ENHANCING RECRUITMENT AND RETENTION OF VOLUNTEERS IN THE U.S. COAST GUARD AUXILIARY

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The U.S. Coast Guard lacks the personnel and resources to fill critical gaps in its safety and security missions without help from its volunteer arm, the Coast Guard Auxiliary. It is for this reason that Department of Homeland Security and Coast Guard leaders have become dependent on the Auxiliary to achieve a number of Coast Guard missions, a reliance that has become more tenuous as Auxiliary membership has dropped 20.61% since 2003, to a current membership of 28,635. This trend is in sharp contrast to membership trends in other large volunteer groups in the U.S. Further, at its current strength, the Auxiliary is far from the 48,000-member goal declared mission-critical by 2000 in the 1987 Coast Guard report to the U.S. Congress.

This thesis describes the Auxiliary's 69-year history and examines the reasons for the organization's decreasing membership. In this process, the thesis also reveals the absence of a systematic, quantitative tool to assess Auxiliary recruiting and retention practices. This thesis proposes the use of the Coast Guard Organizational Assessment Survey, already administered to all other components of the Coast Guard, and which, tailored to the Auxiliary, would be extremely effective in stimulating a genuinely useful approach to increasing Auxiliary membership.

KEYWORDS: U.S. Coast Guard Auxiliary, Volunteer Management, Volunteer Recruiting and Retention, Military Volunteer Groups, Homeland Security Volunteerism, Volunteer Surveys

NATIONALISM IN OTTOMAN GREATER SYRIA 1840-1914: THE DIVISIVE LEGACY OF SECTARIANISM

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As a result of being a leading world power within the community of nation-states, the United States is confronted with the weighty task of how to best employ its influence in creating conditions for a sustainable, peaceful, and just international system of interactions between nation-states. Syria and Lebanon pose some of the most challenging problems to policymakers working to achieve these conditions. Exploring the historical origin of nationalism and sectarianism in Ottoman Greater Syria prior to the outbreak of World War I in 1914 may offer important insights as to unique regional attitudes and sensitivities with respect to democratic reform. This study seeks to demonstrate that nationalists in Greater Syria, within the context of a reforming Ottoman Empire prior to World War I, failed to form a cohesive political expression of intentions through united action, thus allowing the formation of separate Lebanese

and Syrian states. The legacy of an incoherent national identity as a result of competing sectarian visions is an internally divided Lebanese state that struggles to overcome its ineffectual democratic institutions; and a Syrian state encumbered by an entrenched authoritarian regime.

KEYWORDS: Nationalism, Sectarianism, Lebanon, Syria, Ottoman Empire

RESPONDING TO CATASTROPHE VIA LAW-ENFORCEMENT DEPLOYMENT TEAMS: A POLICY ANALYSIS

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This thesis is a policy analysis of the Department of Homeland Security's (DHS) Law-Enforcement Deployment Team (LEDT) concept. The concept outlines the need to form specialized, regional, law-enforcement teams to be deployed across the nation to stricken regions. As written, these teams are designed to provide a backfill to law enforcement agencies who require additional assistance post-natural disaster or post-terror attack. Many of the tenets in this DHS concept are derived from existing federal teams, such as disaster medical assistance teams and urban search and rescue teams.

The concept also outlines how teams will be comprised, what their expected missions will be, and the general vision for how they will be equipped, trained, and transported. However, an analysis of this policy proposal shows that the DHS concept does not provide a proposed structure or management organization to manage this potential national resource. Additionally, it lacks detail on how teams would be monitored, administered, and readied for deployment. This gap is the basis of this thesis project.

The analysis of this condition starts by outlining the debate in law enforcement over the efficacy of centralized versus decentralized police structures. A brief historical narrative of the origins of U.S. law enforcement and a literature review are used to demonstrate the breadth of this debate. Existing law-enforcement management structures are reviewed to determine potential smart practices, outline past errors, and develop guideposts for use in formulating an LEDT management system.

KEYWORDS: LEDT, U.S.&R, DMAT, NDMS, EMAC, ILEAS, Centralized, Decentralized, Law Enforcement, Deployment, First Responder

THE BEIJING OLYMPICS: POLITICAL IMPACT AND IMPLICATIONS FOR SOFT POWER POLITICS

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In the lead-up to the 2008 Beijing Olympic Games, many commentators and scholars debated the potential impact of the Games in China. Some theorized that hosting the Games would lead to greater freedom, and possibly democracy, in China's political life. While the media debate focused on the optimistic possibility for change, scholars were more skeptical about the outcome. In the debate, the 1988 Seoul Games were used as an example of the power of the Olympics to change a nation.

Aside from Korea and China being located within the same region, there are few similarities between the two nations. In order to assess the lack of positive political change resulting from the Beijing Games, this thesis reviews the political history of the Olympic Games, the controversial selection of Beijing as host city, and the policy changes that resulted from the Games. While it is clear that Beijing's hosting of the Olympics stimulated political consequences in China, the event in the near term did not increase freedoms

or the propensity for democratic governance. In conclusion, this thesis evaluates the possibility of long-term change as a result of the Beijing Games.

KEYWORDS: Olympics, Beijing, Soft Power, Sport, Games, Human Rights, Environment

SOURCES OF ANTI-AMERICANISM IN SOUTH KOREA
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The goal of this thesis is to identify the causes of increasing anti-Americanism in South Korea. To accomplish this, research is conducted in three areas. First, the transformation from an authoritarian regime to a democratic government in the 1990s has provided previously unheard of democratic freedom in South Korean society. Second, the perception of inequality in the Status of Forces Agreement and civilian crimes committed by U.S. military personnel since the Korean War have fueled anti-American sentiments. Lastly, the increase in anti-Americanism throughout the world since the U.S. invasion of Iraq and the declaration of North Korea as one of the "Axis of Evil" by the United States have influenced anti-Americanism in South Korea. This thesis evaluates the role of these three independent variables in the increasing anti-Americanism in South Korea.

KEYWORDS: Anti-Americanism, South Korea, North Korea, Japan, Okinawa, Democratization, U.S. Foreign Policy, Soft Power, Hard Power, U.S. Military, SOFA, 1980 Kwangju Massacre, No-Gun-Ri, Sunshine Policy, Axis of Evil, Base Realignment, Wartime Operational Control

DEFENSE SPENDING IN LATIN AMERICA: ARMS RACE OR COMMODITY BOOM?
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Both Venezuela and Chile have increased their defense spending since 2003. This thesis answers the following question: is the commodities boom in South America responsible for the region's increased defense spending? First, it must be determined whether the increase in defense spending is due to an existing arms race, the historically high revenues of a commodity boom, or if it is simply a military modernization effort. What are the possible reactions of neighboring countries? Further, can game theory be used to provide predictions for regional conflict in South America?

Despite the specter of an arms race in the region, this thesis explains that the increased defense spending in both Chile and Venezuela relates more to the 2003–2008 commodity boom than to a competitive arms build-up in the region. The 2003–2008 commodity boom and the resultant availability of resources, combined with the need to upgrade decades-old, dilapidated, military hardware have resulted in a fury of military hardware purchases throughout the region. Additionally, this thesis provides predictions from game theory literature for regional conflict in South America, as other countries in the region have experienced the same benefits from the 2003–2008 commodity boom and have thus increased defense spending. A reciprocating strategy from Robert Axelrod's groundbreaking work *Theory of Evolution* is used. An analysis of the strategy called TIT for TAT shows that cooperation between South American countries is more likely when used assuming indefinite future relations.

KEYWORDS: Chile, Venezuela, Defense, Weapons, Commodity, Oil, Copper, Game Theory, Arms Race

LIONS IN THE PATH OF STABILITY AND SECURITY: OMAN'S RESPONSE TO PRESSING ISSUES IN THE MIDDLE EAST

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Scholars identify numerous factors that created the environment of instability and insecurity in the Middle East. This thesis analyzes two of these factors: 1) a reliance on oil as the primary source of revenue, and 2) dealing with subduing an insurgency. Oman's experience in dealing with these sources of instability is used to illustrate both the challenges they pose to the state and solutions for countering them. Oman's government eventually subdued the insurgency by countering the social factors fueling the insurgents, blocking the mobilization of the insurgents, exploiting the social framing of the issues motivating them, alleviating the lack of political opportunities, and defending against their limited repertoire of actions. Finding itself near the end of the insurgency, per capita, one of the elite rentier oil states, Oman skillfully began investing its wealth into areas that would build a non-oil economy by developing its human resources, diversifying its economy, and developing a viable private sector through correctly assessing its challenges and charting a workable strategy for addressing them.

A better understanding of these issues and workable solutions to them should be of interest to scholars and policymakers who are working to improve security in the Middle East.

KEYWORDS: Oman, Insurgency, Counterinsurgency, Social Mobilization, Rentier State, Economic Reform, Sultan Qaboos, Persian Gulf Security, Oil, Dhofar Rebellion

EFFECTIVE DEFENSE SUPPORT FOR PUBLIC DIPLOMACY WITH A SUB-SAHARAN AFRICA TARGET AUDIENCE: A CASE STUDY OF THE AFRICAN CRISIS-RESPONSE FORCE PROPOSAL

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Renewed U.S. security and diplomatic interest in sub-Saharan Africa suggests the need to evaluate previous Defense Support for Public Diplomacy (DPSD) initiatives. The African Crisis-Response Force (ACRF) serves as a useful lesson for the U.S. African Combatant Command in how to communicate effectively with African partners. The aim of this thesis is to evaluate the effectiveness of Department of Defense (DoD) DPSD sources and messages using the ACRF as a controlled-comparison case study. Based on this goal, the study hypothesizes that a high-level source employing a tailored message objective to the target audience's home venue would achieve the most favorable effect. Based on the analysis of the ACRF proposal process, the thesis only marginally affirms the hypothesis, suggesting that country-specific contextual factors related to military-to-military relations and the condition of public, diplomatic relations plays a more significant role.

KEYWORDS: Africa Crisis Response Force, ACRF, ACRI, Defense Support for Public Diplomacy, USAFRICOM, Target Audience

AN ANALYSIS OF TURKISH–AMERICAN RELATIONS: IMPROVEMENT OR DETERIORATION?

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Turkish–American relations date back to the 1800s; however, these relations were far from well developed and did not solidify until the end of World War II. After an alliance of fifty years, the Second Iraq War indicated doomsday scenarios in terms of U.S.–Turkish relations in the minds of many scholars. The Turkish Parliament's rejection of the proposal of a second Turkish front for American troops in northern Iraq, as well as the July 4 incident in Sulaymaniyah in 2003, froze the dynamics of the relations.

Yet, when the history of Turkish–American relations from the end of World War II until 2003 is examined carefully, it should be clear that every time there was a deterioration of mutual relations, it was replaced by a period of improvement, as the common interests of both countries outweigh the differences. This thesis aims to show that regardless of the level of deterioration, Turkish–American relations are inclined to improve. For this reason, it can be assumed that the deterioration of relations that occurred with the Second Iraq War will follow the trend toward improvement in the future.

KEYWORDS: Turkey, United States, Relations

STATE SUCCESSION IN THE CASE OF A UNIFIED KOREA RESULTING FROM THE COLLAPSE OF NORTH KOREA

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One potential scenario regarding the future of North Korea is state collapse and subsequent unification with South Korea. Effectively isolated from the international community and the world economy, bereft of the great power patronage that it once enjoyed from the Soviet Union and China, and enduring economic shortages and distress, Pyongyang faces challenges that may cumulatively lead to its dissolution. Were collapse to occur, unification with the South is a plausible consequence, one expected by many South Koreans.

However, unification of the Korean peninsula by the South's absorption of the North faces numerous obstacles. There are many possible legal and institutional issues that would be raised by the collapse of North Korea and that would, in turn, figure into prospects for unification with the South. These include:

- South and North Korea's membership as sovereign states in the United Nations;
- Historical issues stemming from the Korean War, including the continuing relevance of the United Nations and Combined Forces Commands; and
- Legal stipulations incorporated into past North-South agreements, such as the 1992 "Inter-Korean Basic Agreement."

Adding to the complexity of these issues is the geopolitical context in which their resolution must be addressed. In addition to the goals and policies of Seoul and Washington in dealing with state collapse in North Korea, the concerns and approaches of Beijing, Moscow, and Tokyo will also have an impact on how these legal and institutional questions are solved.

Given these complex issues, it is not a foregone conclusion that North Korea, following collapse, may easily be incorporated into a unified Korean state under Seoul's direction. Therefore, it is suggested that the South Korean government needs to prepare for a North Korean collapse that could lead a possibly unified Korean state in Seoul's direction. Suggestions for such preparation can be categorized into three areas: political/diplomatic, military, and social/economic.

Recent reports concerning North Korea say that North Korean leader Kim Jong-Il's health is deteriorating, and many North Korean specialists carefully anticipate that this may bring about a struggle

for political power. Considering the situation, no one can confidently anticipate the situation of North Korea in the future. Therefore, it is the right time for the South Korean government to consider all possibilities and prepare for all possible situations. With these efforts, a unified Korean state can be directed towards Seoul.

KEYWORDS: Unified Korea, Collapse of North Korea, State Succession, Unification Policies, Korean War

"PROBABLE CAUSE" FOR MARITIME INTERDICTIONS INVOLVING ILLICIT RADIOACTIVE MATERIALS

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Existing international frameworks that govern maritime interdiction entitle the boarding of a vessel in international waters only if justified by reasonable grounds to suspect that the vessel is engaged in illicit activity, a legal concept similar to the U.S. principle of "probable cause." Given recent advances in radiation-detection technology, this thesis considers how this concept could be strengthened by the use of detectors for maritime interdiction of illicit radioactive materials, a problem that spans both policy and technical issues. To address this problem, the thesis incorporates analysis of both legal and technical factors related to detection of illicit radioactive materials. The thesis includes a comprehensive compilation and examination of the legal and institutional issues related to probable cause determination. Technical evaluations of the Adaptable Radiation Area Monitor (ARAM), a state-of-the-art, remote radiation-detection system, are provided to determine its suitability in supporting probable cause determinations in a maritime environment. Based on these technical evaluations and an understanding of the legal and institutional issues related to probable cause determination, it is concluded that radiation-detection technology offers great promise in promoting effective interdiction operations, which will improve safety and reduce the risk of illicit transport of radioactive materials.

KEYWORDS: Probable Cause, Maritime Interdictions, Nuclear and Other Radioactive Materials, Radiation Detection and Identification, Law of the Sea, Conventional and Customary International Law, Proliferation Security Initiative, PSI, NATO Operation Active Endeavour, SUA Convention, War on Terrorism, Belligerent Status, Doctrine of Self-Help, Doctrine of Necessity, Doctrine of Pre-Emptive or Anticipatory Self-Defense, Scintillation Detectors, Gamma/X-Ray Interactions, Spectroscopy, Photoelectric Absorption, Compton Scattering, Pair Production, Detector Counting Efficiency, Adaptable Radiation Area Monitor, ARAM

DETERRENCE AND ENGAGEMENT: U.S. AND NORTH KOREAN INTERACTIONS OVER NUCLEAR WEAPONS SINCE THE END OF THE COLD WAR

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The North Korea nuclear crisis needs to be understood comprehensively, taking into account both international relations and the domestic political dynamics of the countries involved. Thus, this thesis analyzes North Korean and U.S. policies by examining their policies in two nuclear crises, 1993-94 and 2002-present, and proposes an improved option for reaching a nuclear-free Korean peninsula.

This thesis finds that North Korea has pursued nuclear weapons with a unique historical, cultural, and political background-based strategy as both a security mechanism and as a diplomatic tool to help

overcome its economic difficulties. Recently, it has shown a somewhat more predictable policy toward nuclear issues. In terms of U.S. responses to North Korea's nuclear program, the Clinton administration attempted to modify North Korea's bad behavior with engagement. By contrast, the Bush administration tried to change the Pyongyang regime by adopting a hard-line approach. However, since North Korea's explosive test in October 2006, the United States has again engaged positively with North Korea. The best option for achieving North Korean denuclearization is to apply multilateral and integrated threat-reduction programs in North Korea in a comprehensive manner, with responsibility shared by all of the partners in the current Six-Party Talks.

KEYWORDS: North Korea, North Korean Nuclear Weapons, North Korea Nuclear Negotiation, U.S. North Korean Policy

287(G): CROSS-DELEGATING STATE AND LOCAL LAW-ENFORCEMENT OFFICERS WITH FEDERAL IMMIGRATION AUTHORITY – HOMELAND SECURITY REMEDY OR RUE?

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As a result of the federal government's shortcomings in thwarting illegal immigration, state and local law-enforcement agencies are now largely shouldering the problem of criminal activity associated with illegal immigration. Section 287(g) of the INA allows state and local police to actively participate in immigration enforcement, but has raised concerns about how to balance public safety with concerns of a "chilling effect" on the immigrant community. This thesis surveys current and prospective 287(g) participants in order to develop a model for voluntary local, state, and federal immigration-enforcement collaboration. The proposed model confines immigration enforcement to a small group of select officers representing agencies that volunteer based on the needs of their communities; ICE agents would be active participants. The enforcement would target serious crimes that support illegal immigration, such as alien smuggling, fraudulent documents, transnational gang activity, and drug trafficking. Enforcement efforts would be supplemented by community outreach and efforts to mitigate the chilling effect that deters many state and local police from engaging in immigration enforcement.

KEYWORDS: Interior Immigration Enforcement, ICE, 287(g), Local, State, and Federal Immigration Enforcement Collaboration

DECIDING WHO LIVES: CONSIDERED RISK CASUALTY DECISIONS IN HOMELAND SECURITY

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Homeland security was changed by the events of September 11, 2001, including how life and death decisions are made. Terrorism, all hazards, and public health issues increase the number of decisions involving the expenditure of civilian lives. These considered risk casualties are akin to the military concept of "acceptable losses." Homeland security professionals have little or no experience, let alone guidance, in decision-making under circumstances that bring this condition to the civilian population.

Other disciplines, such as philosophy, theology, bioethics, and the military, etc., have examined principles that are involved in the concept of accepting loss of life and have identified theoretical circumstances under which acceptance is achieved. Homeland security has had little discussion of these matters and virtually no criteria to support such decision-making. Examining those observations, and how those disciplines test the concept, can inform and assist homeland security practitioners when having to make these decisions.

Examining homeland security events that addressed loss of life can expand the range of scenarios those disciplines use for their analysis. An educational process that draws on both sectors' experience e can serve to improve decision-making capabilities. Future research opportunities exist within and external to homeland security and those disciplines.

KEYWORDS: Considered Risk Casualty, Acceptable Losses, Bioethics, Philosophy, Theology, Military, Homeland Security, Decision Making, Emergency Services, New York

THE INSTRUMENTS OF NATIONAL POWER: ACHIEVING THE STRATEGIC ADVANTAGE IN A CHANGING WORLD

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This thesis employs the historical method to illustrate that the central aim of U.S. basic national-security policy and strategy is and has been to achieve and maintain the core national interests - ensure the physical security of the nation, the nation's values, and the nation's economic prosperity - and core desired end-state – provide for the enduring security of the American people – by exerting the full spectrum and reach of its instruments of national power in peace and in war. To accomplish this, U.S. national security policy and strategy must dispose of the artificial walls currently separating its foundations and realign and re-synchronize the capabilities resident in its instruments of national power. Doing so will enable the U.S. to achieve the strategic advantage. In sum, this thesis illustrates that national security encompasses homeland defense and security, and that the current architecture is counterproductive because it destabilizes and retards the capabilities, including the "reach," of the instruments of national security by creating unnecessary friction and competition for resources between them and their proponents and denigrating their capabilities to achieve the strategic advantage. Absent a secure homeland, there is no national security and no strategic advantage.

KEYWORDS: Instruments/Elements of National Power, Military, Informational, Diplomatic, Law Enforcement, Intelligence, Finance, Economic, Presence, Projection of Power, Deterrence, Containment, Basic National Security Policy, MIDLIFE, BNSP, Strategic Advantage, Decision Advantage, Strategy, Ends, Ways, and Means, International Relations, Threat

MADE IN CHINA: POLICY ANALYSIS AND PRESCRIPTIONS TO IMPROVE CHINA'S CONSUMER PRODUCT SAFETY REGULATORY REGIME

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If it is "Made in China," would you still buy it? This question has recently taken on particular significance in the wake of a series of scandalous oversights regarding the safety of consumer products manufactured in China. If this trend continues, it could damage the sales of Chinese-produced goods in the international marketplace. While this may appear to be a relatively minor issue in the context of China's overall political economy generally, and its dramatic economic growth of the past few decades more particularly, if it is not addressed the consequences could actually be quite serious. If this issue, on its own or in combination with other problems, drastically undermines China's economic growth, the ruling Chinese Communist Party might find itself facing increased domestic instability. Domestic instability in China could in turn contribute to regional instability in Northeast and Southeast Asia. In this context, this thesis outlines realistic policy options that the Chinese government could implement to both address consumer product-safety in the future and mitigate contemporary concerns following the recent bout of consumer product-safety lapses. More broadly, this thesis moves beyond simply laying out policy prescriptions and presents a new institutional arrangement that, if implemented, would prevent future product-safety problems. It provides a policy framework that would effectively address international and domestic concerns with respect to the quality and safety of Chinese products.

KEYWORDS: People's Republic of China, Chinese Foreign Policy International Trade and Commerce, Consumer Product Safety, Food and Drug Regulation in China, Protectionism, Lead Contaminated Products

ENERGY REGULATION EFFECTS ON CRITICAL INFRASTRUCTURE PROTECTION

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U.S. critical infrastructure includes those assets that are vital to maintaining the nation's security, economy, and public health and safety. A reliable supply of electric power provides an essential foundation for the daily operation of all national critical infrastructure, as well as most aspects of modern society. A sustained loss of electricity would be significantly detrimental to the economy and the health and security of the nation. Since 1935, the U.S. electric power industry has been heavily regulated in order to address issues such as consumer protection, rate control, conservation, and market competition. However, legislators have not considered the impact of regulations on the resiliency of critical infrastructure. This thesis argues that the energy-sector regulatory framework has directly resulted in decreased security and reliability of the electric power infrastructure. Energy legislation has created a "tragedy of the commons" situation for power transmission lines where utilities are reluctant to invest in infrastructure needed to ensure the reliable delivery of electricity. The solution to ensuring the resilience of electric power infrastructure is to craft a combination of regulatory improvements, reliability standards, and financial incentives to ensure the electric power industry is able to provide the foundational structure needed for U.S. national security.

KEYWORDS: Energy, Energy Legislation, Energy Regulation, Deregulation, Electricity, Electricity Market, Power Grid, Critical Infrastructure, Critical Infrastructure Protection, Homeland Security, National Security

BUILDING A BETTER LEGACY: CONTRASTING THE BRITISH AND AMERICAN EXPERIENCES IN IRAQ

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The U.S. invasion of Iraq and its continued presence has been costly in terms of lives, money, and reputation. Britain suffered the same consequences in Iraq during its post-World War I mandate. In both cases, the U.S. and Britain attempted Iraqi state building following the initial successes of their invasions but were met with significant political and institutional obstacles. Critics of the U.S. invasion often state that the American administration should have heeded the lessons learned from the British Mandate.

This thesis carefully examines the case studies of the British Mandate and the U.S. involvement in Iraq in order to show that the two experiences are not identical. First, the ideological motivation and impetus for the invasions differ substantially. The U.S. notion of stability and security through democracy is arguably more conducive to state building than the underlying imperialist motivations of the British. Moreover, the progression of "World Time" has created a dissimilar operational environment between the two invasions and state building endeavors. The U.S. state building venture will hopefully yield better results and create a more stable Iraq than that created by the British Mandate.

KEYWORDS: British Mandate, Iraq, Occupation, World Time, Operation Iraqi Freedom, State Building

COVERING THE HOMELAND: NATIONAL GUARD UNMANNED AIRCRAFT SYSTEMS SUPPORT FOR WILDLAND FIREFIGHTING AND NATURAL DISASTER EVENTS

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Over the past decade, the United States government has had to cope with increasingly severe, large-scale, natural disasters. The 2004 hurricane season alone caused 167 deaths and an estimated $46 billion in damages. The following year, Hurricane Katrina took 1,330 lives and caused an estimated $96 billion in damages. The 2007 fire season saw over 85,000 wildland fires consume more than 9.3 million acres. In southern California alone, wildfires forced over half a million people to evacuate their homes, destroyed over 3,079 structures, and caused over $1.8 billion in damages. This thesis examines the possible non-traditional and creative use of unmanned aircraft systems to mitigate the threat and effects of natural disasters, assist with search and rescue, and aid post-disaster recovery efforts. This work investigates the use of National Guard unmanned aircraft systems to provide lead agencies support prior to, during, and following major disaster incidents. The thesis also explores the benefits of and challenges to setting up, within the United States, National Guard units operating unmanned aircraft systems equipped with specialized sensors (in a similar fashion to the National Guard modular airborne firefighting system). Subjects for follow-on research are offered.

KEYWORDS: National Guard, Unmanned Aircraft System, Wildland Forest Fire, Natural Disaster, MQ-1 Predator, MQ-9 Reaper, Autonomous Modular Sensor, National Airspace System, Forest Service, National Interagency Fire Coordination Center, Department of Defense

EXPANSION OF THE U.S. IMMIGRATION AND CUSTOMS ENFORCEMENT'S CRIMINAL ALIEN PROGRAM IN THE WAR ON TERROR

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The continued presence of criminal aliens, non-citizens present in the United States either legally or illegally, poses a significant threat to the security of this nation. While criminal aliens are present at all levels of the criminal justice system, the Immigration and Customs Enforcement's (ICE) current Criminal Alien Program only addresses criminal aliens encountered at the state and federal level. This thesis examines how ICE's Criminal Alien Program can be expanded at the local and county level, the possible effects this expansion will have on ICE in detaining and removing criminal aliens, and whether this removal of criminal aliens is an effective and efficient weapon in a terrorist-prevention strategy. Individuals from the Joint Terrorism Task Force and the New York City Police Department's Shield are interviewed concerning whether the efficient removal of criminal aliens is an effective tool in the war on terror. In researching the expansion of ICE's Criminal Alien Program and the issues that arise from such expansion, structured formal interviews are conducted with a representative mix of ICE field officials varying in size and physical location in the United States. The creation of a mega-community amongst the stakeholders involved in ICE's Criminal Alien Program should be included in U.S. counterterrorism strategy.

KEYWORDS: Criminal Alien Program, Criminal Aliens, Removal of Aliens, Aggravated Felons, Immigration, Illegal Aliens, Secure Communities, Financing of Terrorism, Prison Radicalization

GLOBALIZATION AND ITS IMPACT ON THE MIDDLE EAST

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Participation in globalization would be a great contributing factor to obtaining stable economic growth among Middle East states. In fact, globalization and its use in economic development have profound importance both for the region's stability and the global economy. Middle East countries should find a way to use globalization to their benefit. In order to gain this least globalized region's integration into the global economy and promote international institutions' support to the region's economic developmental process, it is important to understand globalization and its impact on the region. While change is inevitable, in this age of modern technology, information, and communication, it is not in the Middle East countries' best interest to close their doors to global integration. Thus, it is crucial to look at globalization's actual definition, the perception from the Middle East states' point of view, and globalization's impact on the region. A closer look at this new driving force of the world indicates both its positive and negative impact on the Middle East economy. A systematic and methodical understanding of those impacts is required to develop the region's economy and to have it gain stability. This may lead the region to a desirable economic pattern.

KEYWORDS: Economic Globalization, Middle East, Impact of Globalization, Economic Reform, Trade, Foreign Direct Investment, FDI, Good Governance, Rule of Law, Economic Development, Stability, Middle East Economy, Global Economy, World Bank, IMF, WTO, MEFTA, GMEI, SAPs

MILITARY AUTHORITARIAN REGIMES AND ECONOMIC DEVELOPMENT: THE REPUBLIC OF KOREA'S ECONOMIC TAKE-OFF UNDER PARK CHUNG HEE

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After World War II, several new countries were born, many of which came to have authoritarian regimes. The authoritarian regimes depressed civil liberties among their peoples, but in some cases, they contributed to their own democratization, ironically, by pursuing economic development. Republic of Korean President Park Chung Hee seized control of political power by coup in 1961. Until he was assassinated in 1979, he acted both as dictator of South Korea's political order and as founder of the South Korean economic take-off.

This thesis first looks into how Park's administration accomplished economic development, unlike the preceding Rhee Syngman regime. This research finds an intrinsic difference between a military bureaucracy and export-oriented industrialization. Also, as an extrinsic difference, special demands from the Vietnam War are discussed. The United States fully participated in the Vietnam War during the period of Park's regime. The economic effect gained from South Korea's participation in the Vietnam War absolutely influenced the export-oriented economic-growth policy implemented by Park's administration.

This thesis assesses the differences of both countries by comparing Park's regime to Pinochet's regime in Chile. Both regimes were military governments, but South Korea implemented economic development with powerful intervention, and Chile fulfilled economic reform with free markets. This research examines what made these two countries select different forms of national economic policy.

KEYWORDS: Authoritarian Regimes, Park Chung Hee, Pinochet

TURKEY'S MEMBERSHIP IN THE EUROPEAN UNION: ANALYZING POTENTIAL BENEFITS AND DRAWBACKS

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Relations between Turkey and European integration institutions began with Turkey's application for associate membership in the European Economic Community (EEC) in 1959. Turkey applied for full membership in the EEC in 1987 but did not gain candidate status until 1999. Since 1999, relations between Turkey and the European Union (EU) have gained momentum, and Turkey's EU accession negotiations began in 2005. Since that time, discussions about the implications of Turkey's prospective EU membership have become more serious and extensive in both Turkey and the EU. This thesis analyzes the potential advantages and drawbacks of Turkey's EU membership for both Turkey and the EU. It considers economic, social, political, and security factors. The main conclusion is that, taking into account all possible effects, the possible advantages of this membership outweigh the potential drawbacks for both Turkey and the EU. Greater efforts to conclude the negotiation process with full EU membership for Turkey would therefore be highly desirable.

KEYWORDS: Turkey, European Union, European Security and Defense Policy, NATO, European Commission, European Council

NEGLECTED ISSUES AND POSSIBLE STRATEGIES FOR THE IRAQI ECONOMY AFTER THE 2003 INVASION

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National interests and plans for the future play an important role in international relations. Because the Middle East encompasses one of the most important resources – oil – ongoing events in the area have impacted world economic conditions. For this reason, this thesis touches on the Iraqi economic situation after the 2003 invasion, since it plays a crucial role in the global economy and in security. Beginning with the wrong policies of the Baath regime in the pre-invasion period, this thesis continues with the main problems of Iraq in the economic realm, then focuses on the three neglected issues—the informal economy, deterioration in social capital, and the insurgency and criminal gangs. All of these issues require great attention to build and maintain a secure and stable environment in Iraq. Lessons learned to date are provided, and local-level strategies to solve these problems are proposed. The thesis concludes with general strategic points to look at in the future.

In this thesis research, the latest formal reports are used to reveal the current situation in Iraq. Scholarly interpretations are cited to evaluate, in a broad sense, the aftermath of the 2003 invasion in Iraq.

Finally, this thesis emphasizes the required remedies for a better Iraqi economy, and possible future expectations from U.S. decision-makers.

KEYWORDS: Iraqi Economy, The Informal Economy, Deterioration in Social Capital, The Insurgency and Criminal Gangs, Inflation, Unemployment, Provincial Reconstruction Team, The Commander's Emergency Response Program, Microfinance Institutions

QUALIA: A PRESCRIPTION FOR DEVELOPING A QUALITY HEALTH THREAT ASSESSMENT

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The 9/11 Commission Report called for consolidation of intelligence assets in order to unify the knowledge base of the intelligence community agencies. This concept gave rise to the fusion center as a place for the fusion of multiple information sources from local, state, and federal levels of government. Although the need for inclusion of health and medical information in fusion centers has been documented, relatively few have done so, and a product designed specifically toward health and medical intelligence does not currently exist at the state or local level. The purpose of this paper is to document a methodology for the development of a health threat assessment as a means for the intelligence community to maintain a decision advantage, particularly at the state and local level, where the intelligence developed will provide the most benefit to first responders and the local community. This model demonstrates the need for the public health and medical community to improve collaboration across sectors to produce a more integrated product that enhances the understanding of the entire community, thus developing qualia. This can only be accomplished through trust, complete transparency, and clarification of expectations in order to establish the consummate information-sharing community.

KEYWORDS: Public Health, Intelligence, Fusion, Situational Awareness, Qualia, Threat Assessment, Medical, Social Networks, Collaboration

OPERATION NOBLE EAGLE AND THE USE OF COMBAT AIR PATROLS FOR HOMELAND DEFENSE

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This thesis considers why, more than seven years after 9/11, the United States Air Force (USAF) is still flying combat air patrols (CAPs) over the United States in support of Operation Noble Eagle (ONE). The USAF is struggling to support two regional conflicts while defending the homeland and trying to sustain and recapitalize its fleet of aircraft. Given these broader, long-term requirements, it is time to reevaluate the need for ONE's costly airborne CAPs in light of improvements in aviation security, the absence of terrorist attacks on the homeland, and the absence of actionable intelligence indicating an imminent air threat in America. The following sub-areas are researched to help evaluate and recommend changes to the current ONE CAP policy: the history of air defense in America; U.S. air defense mistakes on 9/11 and the evolution of ONE; improvements in the intelligence community and aviation security since 9/11; specific threats to aviation and the risk of another 9/11-style attack in the United States; and the cost and impact of the ONE alert and CAP missions on the combat capability of the participating USAF squadrons. The thesis concludes by considering other, more cost-effective, air-defense systems available to support Noble Eagle in lieu of fighter CAPs.

KEYWORDS: Operation Noble Eagle, Combat Air Patrols, 9/11, Homeland Defense, Air Defense, Aviation Security, North American Aerospace Defense Command, NORAD

PREPARING FEDERAL COORDINATING OFFICERS TO OPERATE IN CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR ENVIRONMENTS

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In this thesis, the Federal Emergency Management Agency's (FEMA) Federal Coordinating Officer (FCO) function is examined as it relates to chemical, biological, radiological, and nuclear (CBRN) operations. It is suggested that targeted changes can be made to ensure that the FCOs are better prepared to manage the additional complexities of a CBRN environment. Changes include addressing the FCOs from the systems approach – internally to improve the FCO personal and professional development; external organizational design to improve the FCO's cross-jurisdictional operating environment; and agency support changes to provide the FCOs with additional CBRN staffing expertise to aid in managing the complexity. If the recommendations herein are adopted, the critical command and control function of the FCO in a CBRN environment will be substantially enhanced, and the readiness level of the federal response system will be greatly improved.

KEYWORDS: CBRN Leadership, CBRN Training, Complex Response and Recovery Environment, Federal Coordinating Officer, Federal Senior Leadership Response, Incident Management Assist Team-CBRN, Federal Emergency Management Agency

EMERGENCY MANAGEMENT SPAN OF CONTROL: OPTIMIZING ORGANIZATIONAL STRUCTURES TO BETTER PREPARE VERMONT FOR THE NEXT MAJOR OR CATASTROPHIC DISASTER

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During a statewide disaster in Vermont, one of the most important actions Vermont Emergency Management should take during the response phase is to maintain awareness of the situation and provide coordinated logistical support. If the state does not understand what is occurring, or is not able to perform resource coordination in support of response efforts across the state, then local and state responses are not coordinated, and actionable federal requests for assistance cannot be articulated. Forty-five states have county emergency-management structures between municipal and state structures, which regionalize emergency management within those states. Of the five states without county emergency-management structures, Rhode Island has 39 municipalities, Connecticut and Massachusetts have established regional emergency-management structures that do not align with the counties, New Hampshire has 234 municipalities linked to the state emergency-management center, and Vermont has 251 municipal emergency-management directors who are linked directly to a single state emergency operations center. This paper examines emergency-management span of control nationally, surveys emergency management directors in four New England states, and proposes a regional construct for emergency management in Vermont. The goal is to enable effective emergency management during the next man-made or natural disaster.

KEYWORDS: Emergency Management, Span of Control, Span of Coordination, Organization, Organizational, Structures, Transformation, Regionalization, Vermont, New Hampshire, Emergency Management Director, Municipal, Local, State

ENERGY SECURITY AND TURKEY

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Energy security has acquired increasing importance in the western world, as some energy producers are using oil and gas for political leverage. In addition, alongside established players, new and temporarily weak central Asian countries are also looking for guaranteed stability and a secure environment in order to sell their gas and oil on the world market without any interruption or mandate by established producers.

Guided by the enduring legacy of Mustafa Kemal Atatürk, Turkey has been pursuing a policy of "Peace at Home and Peace Abroad" since the very establishment of the new Republic. In incorporating this idea into Turkey's energy security policy bona fides, the country is becoming a key ally for the U.S. in the region. Indeed, the U.S. will need this reliable partner in the near future, since that energy security will be one of the main challenges for U.S. foreign policy in the years ahead.

KEYWORDS: Energy Security, Natural Gas Pipelines, Crude Oil Pipelines, The New Great Game Theory, Energy Hub, The Caspian Basin, The Middle East, Global Economy, OPEC

LEADERSHIP MATTERS: PRIME MINISTER KOIZUMI'S ROLE IN THE NORMALIZATION OF JAPAN'S POST-9/11 SECURITY POLICY

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For many years following the end of World War II, Japanese leaders followed the Yoshida Doctrine, which placed the nation's priority and resources on economic recovery and growth at the expense of defense spending. Tokyo was able to do this through the U.S.–Japanese alliance during the Cold War years. The end of the Cold War and the "checkbook diplomacy" of the first Gulf War forced Japan's leadership to rethink how it approached foreign policy, and marked the beginning of the end for the Yoshida Doctrine and the beginning of the normalization of Japan's security policy.

It would take another ten years and another Gulf crisis before Japan would cross the threshold of deploying its armed forces overseas during wartime conditions for the first time since the end of the Pacific War. Prime Minister Jun'ichiro Koizumi was the leader who orchestrated this remarkable achievement to expand Japan's security policy to better align Japan's international contributions to its economic status as the second largest economy in the world. This thesis analyzes Koizumi's specific contributions to the normalization of Japan's post-9/11 security policy and discusses why it took his specific brand of leadership to allow Japan's security policy to expand.

KEYWORDS: Koizumi, Japan, Normalization, U.S.–Japan Alliance, Constitution, Article Nine, Self Defense Force

REGIONAL MASS-FATALITY MANAGEMENT IN A PANDEMIC SURGE

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National and state planning documents designate public health as the lead for mass-fatality management (MFM). MFM planning, however, demands multiagency participation and full public-business-government leverage. This thesis explores pathways to reach operational, regional, MFM capability in Ohio, but also has implications for MFM planning across the nation. Survey research is conducted with three key MFM stakeholder groups: county coroners, emergency management directors, and health commissioners. The survey addresses realistic and actionable MFM planning by: 1) identifying state guidance gaps; 2) identifying local/regional operational gaps; 3) assessing regional resource capabilities; 4) categorizing proposed solutions to address identified gaps; and 5) listing legal, financial, and organizational barriers to the solutions. Findings show that the key stakeholder communities are confused, with a willingness to build MFM capacity that is accompanied by worries about who should lead and how to coordinate efforts. Research recommendations include a three-sector collaboration (government-business-citizens) operating at the regional level and public engagement. Another recommendation calls for an alignment of state guidance and regional operations with the Joint Task Force Civil Support Working Group MFM areas: command and control; body identification; medico-legal investigation; morgue operations; funeral services; final disposition; and family assistance and behavioral health services.

KEYWORDS: Mass Fatality Management, Mass Fatality Response and Recovery, Pandemic, Pandemic Influenza, Public Engagement, Public Health Surge, Public Health Preparedness, Regional Capacity, Regional Response, Surge

U.S. VICTORY IN THE FIRST GULF WAR: IMPLICATION FOR THE FUTURE OF U.S. FOREIGN POLICY

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In 1991, the United States was at war — not as grand a war as the Second World War, but a significant war. This new war managed to form a coalition of many nations to fight Saddam Hussein's force and restore the ruling family of Kuwait. This thesis analyzes whether direct military involvement was a rational approach for the United States. The Bush administration crafted a plan that included a massive war coalition; it effectively outnumbered and overwhelmed the nearly one-million-strong enemy forces and eventually increased the success of the coalition military mission. While the United States military strategies were successful in defeating the Iraqi forces in the Gulf War, this thesis argues that a decade or so from today, the way observers will perceive this event will depend in large part on whether a healthier relationship exists between the U.S. and the region at large. Clearly, much will depend on the extent to which the Gulf War diffused a crisis without producing another crisis.

KEYWORDS: The First Gulf War, Iraq, United States, Coalition Members, Foreign Policy, Changing World, Globalization, Partnership, Soft Power, Second World War, Realism

NUCLEAR AND SOLAR ENERGY: IMPLICATIONS FOR HOMELAND SECURITY

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In the eyes of many experts, the world is moving away from oil as a cheap energy source. As this future unfolds, the United States may perform a leading role as the planet's premier energy consumer. Solar and nuclear power provide possibilities for this future which represent the extremes in terms of energy supply. The question this thesis asks is: what are the security implications of a substantial shift in energy policy in either a solar or nuclear direction? The analysis begins with the question of what a substantial shift is and defines substantial in terms of energy shortage, energy independence, and climate change. The proposed energy futures to match these shifts are then judged with respect to three security criteria: resource access, nuclear weapons proliferation, and infrastructure protection. Accepting many uncertainties with future economic and technical solutions (even as proven systems are proposed), solar power provides the most stable future in terms of security alone. However, because these options are not mutually exclusive, both cases offer security challenges that are addressed in the concluding recommendations.

KEYWORDS: Energy, Alternative Energy, Resource Nationalism, Energy Security, Homeland Security, Nuclear Energy, Solar Energy, Energy Return on Investment, Critical Infrastructure Protection, Resilience

NATO AND U.S. BALLISTIC MISSILE DEFENSE PROGRAMS: DIVERGENT OR CONVERGENT PATHS?

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NATO and the United States are actively pursuing missile defense policies. NATO has invested in the Active Layered Theatre Ballistic Missile Defense (ALTBMD) information network to support the theater missile defense (TMD) capabilities of specific allies for the protection of forward-deployed troops, and studies of the feasibility and political-military implications of ballistic missile defense (BMD) for the protection of NATO territory, forces, and population centers. The U.S. program includes TMD activities in cooperation with NATO allies, such as Patriot, as well as BMD research and deployment. The U.S. proposal to deploy BMD system elements in Poland and the Czech Republic has led to more extensive discussions of BMD in the alliance. The North Atlantic Council made BMD-relevant decisions in April 2008. The United States and its NATO allies nonetheless seem to differ greatly on the urgency and importance of pursuing BMD. TMD generates far more cooperation and support within the alliance than does BMD for the protection of NATO territory, forces, and population centers. This thesis compares TMD and BMD policies within the alliance in an attempt to identify the causes of disagreements on BMD policy and to propose a course of action that may meet the alliance's goals.

KEYWORDS: NATO, Missile Defense, Ballistic Missile Defense, Theater Missile Defense

INDICATORS OF INFORMAL FUNDS TRANSFER SYSTEMS: A COMPARISON OF TRADITIONAL AND MODERN SYSTEMS

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Informal funds transfer systems (IFTS) are prevalent throughout the world and are used for various legitimate and illegitimate purposes. There are many variations of these systems that can be generally classified as traditional or modern systems. Traditional and modern IFTS share many of the same characteristics, but that is the extent of the similarities between these two groups. Traditional systems were developed to meet the legitimate needs of businesses and individuals, and at times became the formal banking system within the Middle East and South Asia. Conversely, modern IFTS were developed purely as criminal systems and have no legitimate purpose. Whereas traditional systems have predominantly positive effects on the communities in which they operate, modern systems are the exact opposite and have predominantly negative effects. The purpose of this thesis is to analyze the use of traditional and modern IFTS in order to identify the specific macro indicators and conditions responsible for their development and continued use. Identifying these indicators will allow regional, national, and international agencies and organizations to detect the emergence or presence of IFTS and focus their efforts to develop effective regulatory policies to limit illegitimate use while maintaining the legitimate aspects of these systems.

KEYWORDS: Informal Funds Transfer Systems, IFTS, Hawala, Fei-Chien, Black Market Peso Exchange, BMPE

CONNECTING OUR NATION'S CRISIS INFORMATION MANAGEMENT SYSTEMS

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Many states and localities have implemented crisis information management systems (CIMS) to integrate situational awareness, notification, and disaster-assessment tools utilized in emergency operation centers (EOC), and to eliminate separate, stovepiped communications.

In February 2004, the Department of Homeland Security (DHS) announced the deployment of the Homeland Security Information Network (HSIN) as the primary means for all jurisdictions and levels of government to share information. The system is redundant with state and local CIMS, which have been and continue to be developed.

Implementing both the integration and interoperability of EOCs requires that the systems used every day be connected; this cannot be achieved through the development of a new system. Implementing this solution will require four steps:

- Jurisdictions utilizing CIMS should do more to leverage built-in capabilities and jurisdictions without CIMS systems to consider purchasing,
- Jurisdictions should integrate the individual information systems currently in use with the jurisdiction's CIMS,
- Jurisdictions should improve their systems' abilities to collect and store information,
- Jurisdictions should create a portal to allow specific information to be shared across larger regional areas at their discretion and with greater control over who receives the information.

KEYWORDS: Crisis Information Management System, Homeland Security Information Network, Emergency Operation Center, National Incident Management System

THE POTENTIAL TRANSFORMATIVE IMPACT OF WEB 2.0 TECHNOLOGY ON THE INTELLIGENCE COMMUNITY

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Web 2.0 technologies can transform and improve interagency collaboration in the intelligence community in many of the same ways that have marked their use through the internet in the public domain and private industry. The potential for success is illustrated in the early stages of ODNI's implementation of the Analytical Transformation Program within the sixteen agencies across the intelligence community. Intelligence analysts have already seen an impact in their ability to connect, share information, and conduct research and analysis utilizing a suite of Web 2.0 technologies, including Intellipedia and A-Space. However, adoption of these technologies in the intelligence community will not be without challenges, including a number that are unique to the intelligence community. Those challenges include the need for the intelligence community to move away from a "need to know" culture towards a "responsibility to provide" culture, the need for increased promotion of these tools, and the need for training on Web 2.0 technologies.

KEYWORDS: Web 2.0, Technology, Collaboration, Information Sharing, Intelligence, Culture, Intellipedia, A-Space

TRANSFORMING THE U.S. IMMIGRATION SYSTEM AFTER 9/11: THE IMPACT OF ORGANIZATIONAL CHANGE AND COLLABORATION IN THE CONTEXT OF HOMELAND SECURITY

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The terrorist attacks on 9/11 led to a fundamental reorganization of the U.S. immigration structure. The Immigration and Naturalization Service (INS) was abolished in 2003, and its missions were transferred into three distinct components within the Department of Homeland Security (DHS): U.S. Citizenship and Immigration Services (USCIS), Immigration and Customs Enforcement (ICE), and Customs and Border Protection (CBP). This thesis focuses on the perceptions of USCIS employees on organizational change and collaboration in the DHS immigration structure that was established in 2003. Effective organizational change is essential for an agency to carry out policies and execute its missions. Collaboration is also vital to the USCIS because it works closely with ICE in combating immigration benefit fraud to strengthen the security of the legal immigration system.

This thesis identifies areas for USCIS regarding future organizational change and enhancements to collaboration with a homeland security partner such as ICE. It further identifies areas, such as collaborative competencies, trust, and networks, for improving collaboration between USCIS and ICE in targeting immigration benefit fraud.

KEYWORDS: Organizational Change, U.S. Citizenship and Immigration Services, Immigration and Customs Enforcement, Collaboration, Trust, Leadership, Immigration and Naturalization Service, Immigration, Fraud, Reorganization, Homeland Security

VIRTUAL COMMUNITIES IN THE LAW ENFORCEMENT ENVIRONMENT: DO THESE SYSTEMS LEAD TO ENHANCED ORGANIZATIONAL MEMORY?

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There is a large body of research on the topic of knowledge management and organizational memory, as well as on the topic of communities of practice and virtual communities of practice. This research looks at three law-enforcement and intelligence-related case studies and how the use of virtual communities of practice (VCoP) in these law enforcement environments can mitigate the loss of organizational memory. This research looks at these VCoPs in an attempt to determine if explicit and tacit knowledge shared in these VCoP environments can be codified and ultimately reduce the loss of organizational memory. The research methodology used in this thesis project is the case study approach. A qualitative analysis of messages, postings, and conversations contained within the VCoP is used to identify the transfer of both explicit and tacit knowledge. Data collection and analysis is conducted based on three VCoP sites. The research conducted for this thesis suggests that a VCoP can mitigate the loss of organizational memory. Interview data and case site reviews support the use of VCoP to mitigate the loss of organizational memory, while providing a means for the transfer of explicit knowledge by those participating in the VCoP.

KEYWORDS: Virtual Communities of Practice, Organizational Memory, Law Enforcement, Communities of Practice, Mitigate the Loss of Organizational Memory

ANALYZING UKRAINE'S PROSPECTS FOR NATO MEMBERSHIP

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Ukraine has a résumé of achievements in its relations with NATO since 1991. However, at the 2008 Bucharest Summit, the NATO allies chose not to offer Ukraine a Membership Action Plan. This thesis examines Ukraine's prospects for NATO membership and investigates the hypothesis that Ukraine's membership aspirations are most affected by two sets of independent variables – internal and external. The two key internal variables that affect the prospects for Ukraine's accession to NATO are public opinion and domestic politics. The majority of Ukrainian society opposes Ukraine becoming a member of NATO, while political discord within the Ukrainian government may also limit the likelihood of Ukraine's accession to NATO. The two main external variables affecting Ukraine's prospects for NATO membership are Russia and NATO itself. Russia adamantly opposes NATO membership for Ukraine, and may apply economic, social, or political pressure against Ukraine if its government continues to pursue membership against Russian wishes. Regarding NATO, it appears that some allies do not believe Ukraine is ready for membership, while others do not wish to provoke negative Russian reactions.

KEYWORDS: NATO, Ukraine, Russia, Membership Action Plan, Ukrainian Public Opinion, Ukrainian Domestic Politics, Orange Revolution, Viktor Yushchenko, Yulia Tymoshenko, Viktor Yanukovych, Jaap de Hoop Scheffer

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